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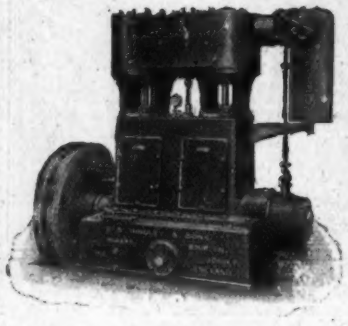

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THE ENGINEER AND THE NATION.

FOLLOWING closely upon the call of the President of the American I.E.E. to the engineer to take his rightful place in national affairs, upon which we commented last week, we find in *Industrial Management* a spirited appeal by Mr. C. E. Knoeppel to every industrial engineer to do his part in the national crisis. The author recognises the immense importance of the rôle that the United States is called upon to fill in the winning of the war; he quotes Mr. H. E. Coffin, of the Council of National Defence, as saying:—"Who is there better fitted by technical training and by life experience for leading the way to this new era of Universal National Service than American engineers? Will vision come to them? Will they translate vision into action—and will they *do it now*?" and after referring to the nation's debt of gratitude to those engineers who have so far given freely of their time, he says:—"The time has now arrived, however, for the Industrial Engineers of the country to step forward, and, in this crisis, as well as during the *post-bellum* period, take their appointed place in the direction of large affairs both governmental and industrial."

Last week we drew attention to the formation of the Engineering Council, which is intended to enable all American engineers to co-operate with the greatest efficiency; Mr. Knoeppel points out that on May 26th the Society of Industrial Engineers was organised, as the outcome of a national conference held to consider the question of industrial preparedness, and he claims that the steps then taken will not only make history, but will put the United States in a better position to wage a decisive and victorious war. The new Society was organised to serve a two-fold purpose: (1) To provide a vehicle whereby the best minds can be enlisted to aid the Government in its present hour of need; (2) generally to promote efficiency and industrial management.

The programme of work which the author subsequently outlines is practically identical with that which has been imposed upon this country, and he remarks, in accord with the Executive Committee of the U.S. National Chamber of Commerce, that these things will have to be done quickly. If any one of various possible eventualities should compel the European Allies to abandon the struggle, the United States would have to bear the brunt of the fighting on her own shores, single-handed, and she "would have to win, or the world would be a worse place to live in than Hell itself." Speedy action is therefore imperatively necessary. But, says the author, "the opportunity before the industrial engineer is not narrowed to the industrial field by any means. *He is needed in the conduct of governmental affairs.*"

We need not follow the details of the new organisation; our aim is to focus attention upon the vast movements in progress in the United States, the complete change of attitude towards the rest of the world, the adoption of new ideas and motives of action, as typified in these great movements in engineering circles, and to suggest again that there is a lesson to be learnt by us from them. British engineers have rendered priceless services to their

country and the world in this great crisis; but have they done all that they could have done if they had been better organised? Assuredly not. The difficulties which have been experienced by individual engineers and scientists of the highest standing in securing opportunities to utilise their knowledge for the benefit of the nation are notorious, and even now our engineering resources are not fully developed. Efficiency should be our watchword, co-ordination and concentration of effort our method of attaining it; we need a national engineering organisation which shall not only assist the Government in every possible way during the war, but which also shall promote industrial efficiency after the war. It rests with our leaders to *lead*.

Reasonable Recruiting.

We have heard many complaints from men in the engineering profession as to the methods in which they have been posted haphazard to any unit, irrespective of their qualifications. We have always believed in the policy of the right man in the right place, and we can only see a loss of efficiency in the Army if men of technical or administrative qualifications are posted without regard to those qualifications. There should be room for technical men in technical posts, and men who have done administrative work are surely men who are fitted to be officers. A friend of ours, an M.I.E.E., &c., &c., spent many months, as he termed it, "muck-shifting," and only his own perseverance brought his technical training to light—or, rather, recognition—and raised him to the rank of Captain in the R.E. That is one case of many where talent has been wasted. There seems to be an impression that the ordinary Officers' Training Corps—such as the Inns of Court and the Artists' Rifles O.T.C.—are no longer open to recruits. This is not so; we have heard of several of our friends who have joined these Corps recently, and they tell us recruiting is going on at the rate of several hundred a month. These are the Corps which those should join who have during the past three years been holding the responsible posts in manufacturing munitions, but who are now able to get released by their various employers. Had they been able to leave two years ago, they might now have been holding commissioned rank, and doing sterling work, instead of being liable to find themselves drafted off to positions where their talents are wasted, though they are eminently fit for commissioned rank.

Reconstruction.

In our opinion, the appointment of Dr. Addison as Minister of Reconstruction is one of the most important steps that the Government has taken to prepare for the after-war situation. During the past year or two there has been no end of inquiry and investigation work done by committees and departments, and the material collected must reach considerable proportions in the mass. Some of it, no doubt, has been well sorted out and sifted already, but it is quite the right thing to appoint a whole-time Minister to guide the Cabinet and the nation concerning the measures which may reasonably be required to emerge. Dr. Addison has been so closely in touch with industrial matters during his period at the Ministry of Munitions that his appointment as Minister of Reconstruction may be regarded as a satisfactory one. He knows as well as anybody how great has been the disorganisation of industry during war-time, and he may be credited therefore with a correct appreciation of the great problems that will arise as demobilisation of industrial workers under coming conditions takes place. His address at a conference with leading representatives of the chemical industries of the country last week shows that he appreciates fully the immediate need of essential raw materials when Peace comes (he indicated a possible shortage even before that event), and the necessity for our increasing the product of all our industrial plants. He is not blind to what the enemy is doing by way of preparation, and he recognises that unless we take time by the forelock we may find ourselves short of essential materials. He asked for the co-operation of the chemical industries, so far as they are concerned in the matter, in taking the necessary steps in time. He proposes to get to work to examine the problems of reconstruction fairly and squarely, utilising the information already gathered together by committees, in order that steps may be taken to mitigate the evils of the reconstructing period by putting some British industries on a much firmer and more scientific foundation. Manufacturing methods must be brought up to the highest pitch of perfection, and better understandings with Labour will make possible the introduction of the improved methods needed to secure that end. We do not think that Dr. Addison will find industry slow to co-operate with him in the great task that he has undertaken.

War Effects on South African Trade.

The report recently issued by the Board of Trade from the pen of H.M. Trade Commissioner in South Africa (Mr. W. G. Wickham), although described as dealing with trade in that territory for the years 1915 and 1916, contains much of interest and value relative to present conditions and future prospects. The portions of chief interest to the electrical and allied trades are summarised in another column. Mr. Wickham rightly points out that it is an open question at least whether annual reports which are merely chronicles of past facts are of value, except in so far as inferences can be drawn and advice extracted for the guidance and increase of future trade. In Mr. Wickham's report, however, it is possible to do a great deal in this direction.

In interpreting the statistics of South African shipments, it must be kept in mind that the high prices offered for commodities, particularly from the United Kingdom, have given an inflated appearance to exports in relation to values of previous years, and they may have provided inducement to export in lines where there was no surplus, and even lines in which there had been little or no production before the war. And as regards imports to South Africa, Mr. Wickham considers that while the high prices ruling have given an appearance of normal or even abnormally large importations, in reality many factors have been at work to cause the market to absorb considerably less in quantity than usual—namely, difficulties in getting freight space, abnormally high freight rates in addition to high prime cost, prohibition of exports from other parts of the Empire, and dear and scarce money, resulting in postponement of public works and private enterprise. On the other hand, of course, the war has created an artificial demand for certain kinds of supplies for public purposes, to the obtaining of which, as necessities for war, there was no official obstacle.

In Mr. Wickham's view, it will be some time before Japan is looked to as a supplier of iron and steel and machinery, but he expects to find that enormous strides have been made during the war as the result of supplying a large proportion of Russia's war needs. This view is, of course, supported direct from Japan itself, although, as yet, it is only in the lighter descriptions of electrical goods that its competition on the world's markets has made itself at all keenly felt. As regards Japanese trade in South Africa, the machinery for development was already established in the form of agencies and branches of merchant houses from Japan. The diversion of Japanese liners from the Suez

Canal route to the Cape provided direct steamer communication.

On the subject of competition and future trade generally, the note that the Trade Commissioner strikes is one that has been frequently sounded in these pages, viz., that even if producers are so busy on work of greater and more immediate national importance that they cannot make goods, or even show samples and catalogues for overseas trade, it is nevertheless imperative that they keep their goodwill alive and have their export organisation ready primed for quick and active operation directly Peace is declared.

The I.M.E.A. and Electricity Supply.

One or two items in the proceedings of the recent annual meeting of the Municipal Electrical Association served to focus the attention of interested circles on the attitude of the ruling members of this guild in regard to the great question of electricity supply reorganisation on a national basis. We referred to this matter at the time, when it was urged that the Council of the I.M.E.A. should come out into the open and place its views on the future of electricity supply and the *rôle* of the municipal authority in connection therewith before its members—a resolution to that effect being adopted.

We do not know that there was any suggestion that the Council had not made up its mind on the subject, but those who are well able to judge have felt that the important interests represented by municipal supply authorities were likely to suffer if some definite pronouncement as to the views and policy of the Association was not very quickly made.

In this connection, the circular letter which has just been issued by Mr. H. Faraday Proctor, the hon. secretary of the Association, and which appears elsewhere in this issue, is no doubt intended to clear the atmosphere. It contains a synopsis of the views of the Council, expressed in general terms, which include the appointment of a Central Board of Control, subject to Parliament alone, composed of whole-time officers, to exercise the present functions of the Board of Trade, Local Government Board, Home Office, and other departments which at present have a finger in the electricity pie; also the supply of electricity from large power stations controlled and operated by District Boards consisting of representatives appointed by the present statutory undertakings, both local authorities and companies, the distribution remaining with the present undertakers. For the rest, the report of the Lancashire and Cheshire Linking-up Committee, which we note "will be published within a few days," may be expected to shed some light on the working details of the scheme as applied to one of the most important industrial areas of the country.

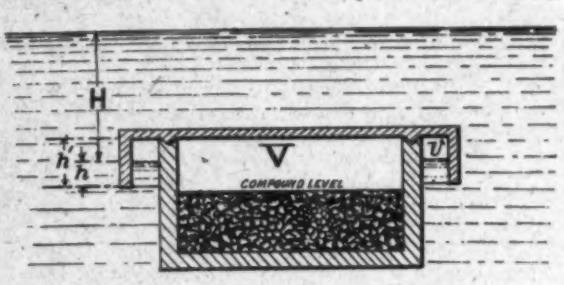
Meanwhile, we share with the Council its regret that full information cannot be imparted at the present time owing to the withholding by the Government of the report of Sir Charles Parsons's (Electrical Trades) Committee and the interim report of the Coal Conservation Sub-Committee; why the former is wrapped in mystery we do not know, but the latter, at any rate, has passed beyond any particular claim to secrecy. We welcome the plain statement of its views by the I.M.E.A. Council, and the prospect of studying the suggested application of the principles outlined by it to the Lancashire and Cheshire area. It is not so much in the general features of reorganisation on broad lines that divergencies of opinion occur as in the details, and the carefully prepared scheme of the Lancashire and Cheshire engineers—both municipal and company—should carry far more weight in responsible circles than a settlement arrived at by a Government Committee which is shrouded in secrecy.

SOME NOTES ON DIVING-BELL COVERS FOR DISCONNECTING BOXES.

By G. W. STUBBINGS.

The diving-bell cover for disconnecting boxes is a most useful device, combining, as it does, a high degree of safety with the maximum of convenience for disconnecting. The time spent in removing nuts from a cover of the bolted-down type is considerable, and, in times of trouble, the advantage in this respect of a diving-bell lid, which has simply to be lifted off, and, after disconnecting, as simply put back, is incalculable. A properly designed diving-bell cover should, moreover, be quite watertight, and thereby escape the uncertainty that always attaches to bolted-down joints for box covers. Cases have from time to time been met with of the failure of diving-bell covers owing to the seal being insufficiently deep, and it will, therefore, be useful to investigate the criteria to which the dimensions of such covers must conform to be successful in given conditions.

For purposes of calculation, a box of simple shape, such as that shown in the diagram, may be taken. If H be the difference in level of the water in the pit and in the sealing



Section of Box with Diving-bell Cover.

space of the cover, h the height to which the water has risen in the bell, h^1 the depth of the sealing space, A the atmospheric pressure expressed as a head of water, and the joint be watertight—

$$h/h^1 = A/(A + H),$$

and, whatever the pressure of the submerging water might be, the water in the bell would never reach the joint. The joint, however, is not watertight, and will not be able permanently to sustain a difference of pressure between the interior of the box and the upper part of the sealing space, and the water will accordingly rise in the bell to a considerably greater height than given by the above expression.

Calling the volume of the air space in the box V, and the volume of the annular sealing space v, the new conditions can be stated—

$$A(v + V) = (A + H)\{V + v(h^1 - h)/h^1\},$$

which finally reduces to—

$$h = h^1 H(V + v)/(A + H)v.$$

There is, however, a further factor to be taken into account. The most dangerous and trying conditions to which disconnecting boxes can be subjected, are undoubtedly those of sudden storm after a spell of very hot weather. In these circumstances, a pit may be flooded with very cold water, and the temperature of the box, which may have been considerable, will be suddenly reduced. Such a reduction in temperature will cause an appreciable lowering of the air pressure inside the box, causing the water to rise higher in the bell than otherwise.

Calling the absolute temperatures of the box before and after flooding T_1 and T_2 respectively, the conditions can now be stated—

$$A(v + V)/T_1 = (A + H)\{V + v(h^1 - h)/h^1\}/T_2.$$

Putting $T_1 - T_2 = t$, this finally reduces to—

$$h = h^1(V + v)(T_1 H + t A)/(A + H)T_1 v.$$

The writer selected at random from the catalogue of a good manufacturer of cable accessories, a line diagram of a four-way box, and scaled off the dimensions. The interior of the box is approximately 20 in. × 14 in. × 4 in., the

sealing space being 1⅛ in. wide by 2 in. deep. Assuming H to be 12 in., T_1 20° C., and t 10° C., the above expression gives a value for h of ⅞ in., a result that can be considered satisfactory.

For given conditions, V and v remaining constant, it is seen that $h = b h^1$, the distance between the level of the water in the bell and the joint is $h^1 - h$, and calling this distance h_s,

$$h_s = h^1 (1 - b).$$

This margin of safety h_s is therefore proportional to h^1, v remaining constant. It therefore follows that it is better to have a deep and narrow seal than one shallow and broad, as inaccuracies of levelling the box will be of smaller importance. The matter of correct setting is one of considerable importance, as the sealing effect of the bell does not commence until the lower edge is completely immersed; and with a wide and shallow seal and a large box inaccurate levelling might lead to serious trouble.

Referring to equation—

$$h = h^1 (V + v) (T_1 H + t A)/(A + H) T_1 v,$$

the worst conditions to which the box will be subjected may be assumed, and the equation may be rewritten—

$$h/h^1 = C (V + v)/v,$$

enabling the relation between V and v to be calculated for a given proportional rise of water in the bell. Putting $h/h^1 = m$, this equation becomes—

$$m = C (V + v)/v,$$

and finally— $$V/v = (m - C)/C,$$

giving the relation between V and v and m for any given conditions. For the purposes of a numerical example, the former values of H T_1 and t may be taken, the corresponding value of C will be 0·0633. If it be considered that under these circumstances the water should not rise more than halfway in the bell—

$$V/v = (·5 - 0·0633)/0·0633 = 7 \text{ approximately},$$

and the volume of the air space in the box should not be more than seven times the volume of the annular sealing space.

The above reasoning shows further the importance of setting the box accurately level, as inaccuracies will not only, as before pointed out, diminish h^1, but will also diminish v, this volume, of course, being calculated as lying above a horizontal plane touching the highest point of the bottom of the bell. The writer has calculated the effect of ¼ in. out of level in setting the four-way box already referred to, and finds that this inaccuracy will diminish the safety margin from 1⅛ in., as before calculated, to ⅞ in.

JAPAN'S PROGRESS IN THE ELECTRICAL INDUSTRY.

By MALCOLM CHALMERS.

Prior to the war Japan used to import considerable quantities of electrical machinery, apparatus, and materials, the total value of which in 1913 amounted to about £790,000. The war has, however, given Japan her opportunity, which she has not failed to put to account. She has turned her attention to the manufacture of this class of goods, with the result that her imports in 1916 were no greater than £320,000, a decline of 60 per cent. Even this does not represent the full facts, for in 1916 there was a special import of submarine cables valued at £132,000, as compared with £5,000 only in 1913. Leaving this out of account, we find that the imports of other electrical goods were valued at £188,000 in 1916, as compared with £785,000 in 1913, a decrease of 76 per cent. This year the decline has been maintained, the imports for the four months ended April being valued at only about £72,000 in all. The following statement gives the details for the various classes of goods in 1916 as compared with 1913 :—

	1913.	1916.
Materials for suspending electric lines	£4,000	—
Submarine cables	5,000	£132,000
Insulated wire, other than cables ...	206,000	2,000
Meters :—		
Amperemeters and voltmeters ...	21,000	7,000
Wattmeters	27,000	13,000
Other kinds	16,000	9,000
Accumulators	25,000	1,000
Telegraph and telephone instruments ...	8,000	6,000
Dynamos, electromotors, transformers, converters, and armatures ...	374,000	40,000
Dynamos with motive machinery ...	65,000	45,000
Filaments for incandescent lamps ...	8,000	63,000
Incandescent lamps	30,000	2,000

Turning now to the export trade, we find that in 1913 Japan exported electrical goods to the value of less than £80,000, whilst last year her exports in this line were valued at no less than £421,000, or over five times as much. In the first four months of this year, moreover, the increase was more than maintained, the exports for that period being valued at £260,000, or at the rate of over three-quarters of a million sterling per year. The details of the exports so far as available in 1913 and 1916 are as follows :—

	1913.	1916.
Insulated wire...	£26,000	£115,000
Electrical machinery	18,000	147,000
Telephones	5,000	92,000
Incandescent lamps	—	67,000

Perhaps the most noteworthy feature shown by the above figures is that relating to incandescent lamps. In 1913, Japan imported £30,000 worth of these lamps and exported none, whilst in 1916 her imports were practically nil and her exports were valued at £67,000. In the four months January-April, 1917, the exports of electric lamps were greater than during the whole of last year, being valued at £84,000, or at the rate of £250,000 per annum.

It will be interesting to see, when peace is concluded and the manufacturing nations now at war are able to compete once more, whether Japan will be able to hold the position she is fast building up for herself in the manufacture of electric lamps. Everything points to the fact that she will, for some excellent modern factories have been erected, and with an abundance of cheap labour and of cheap power derived from the numerous waterfalls of the country, she should be well able to hold her own in the matter of price. Possibly the principal deciding factor will be the question of filament. As will be seen from the fact that £63,000 worth of filament was imported in 1916, Japan has hitherto been dependent on outside supplies for this material. Efforts are being made, however, by Japanese manufacturers to make the country independent of foreign supplies in this respect, and it would appear that they are succeeding in their efforts, for during the first four months of the present year, when more lamps were exported than during the whole of 1916, the imports of filaments were only valued at £17,000.

COAL CONCRETED FROM DUSTS OR ASHES.

In a second paper read before the Society of Architects on this subject (see Electrical Review, June 29th), Mr. R. Goulburn Lovell said that the process of manufacture would be demonstrated, and that the analyses of the component parts and the resultant fuel would be shown.

There were three methods of making the fuel, which might be called A, B, and C. A and B might be termed dry processes. In this case they took as aggregates ashes and coal dust. After sifting the fine dust, which was of little or no value, the coarse aggregate was composed of all between ¼ and ½ in. mesh. This was dried, sprinkled with a special sugar-waste solution, and again dried. The fine aggregate was taken from the coal-cellar dust, only that which passed ¼-in. mesh being used. These two bases should be intimately mixed with the matrix or binder.

Up to this point A process and B process were exactly the same. Process A was employed wherever the sun had much value, or where the heating chambers were available. The mixed aggregates and binder had in some cases a small quantity of creosote oil added, it was then placed in moulds and allowed to concrete, the time varying with the amount of heat available. The fuel, when cold, was emptied out of the moulds, broken up, and hardened by exposure to the atmosphere.

With process B the small quantity of creosote oil, if used, was placed in a boiler or an iron saucepan, the mixture of bases and matrix was added, and placed upon a fire and stirred until a temperature of about 120° F. was obtained, when the whole was emptied into any mould, such as an old pail. In a short time it was cold, and was broken up and allowed to harden.

Process C was a wet process, in which there was no need to dry the aggregates. They were mixed as before, but with a different matrix mixture; the creosote oil, if used, was added and well mixed, the whole was then moistened with the solution until a consistency of mortar or concrete was obtained. It was then emptied into shallow moulds, or between sheathing boards, and dried by exposure, but with protection from the wet.

In all three processes the character of the matrices varied with the character of the aggregates, and the different aggregates had to be treated by different methods. It was usually found that in most cases the smoke of the resultant fuel could be diminished by an increase of the remaining ashes; in the case of furnace fuels the clinkering could by this means be diminished. This method of concreting fuel dispensed with any kind of pressure beyond a slight tamping into the moulds. For low-grade cokes, coals, or bar ashes process A was the best method.

Process B was suited for any form of rotary asphalt plant, either fixed or movable. For all materials high in carbon but low in volatile matter, process B was the best method.

Process C was the cottager's process of producing coal in his own back yard. It would be better for a community to send its ashes and dust to a central depôt, and there have it done under proper supervision, but there was nothing to prevent an isolated individual or firm from utilising their waste materials by this process. For high-grade cokes, high-grade bituminous coals, or a mixture of the latter with ashes, peat, sawdust, &c., process C was the best method.

The analyses of seven different types of fuel made under the three processes, together with the calorific values of their component parts, were given showing for coal dust fuel from 10,000 to 12,570 B.TH.U., and for ashes and coal dust, &c., from 5,000 to 9,000 B.TH.U.

The percentage of raw material in the resultant fuel was from 91 to 99·58 per cent.

Samples of the resultant fuel were shown in each case; they would light from the sticks, incandesce, and flare.

There were many collieries where fine coals were produced in abnormal quantities, due to unusual friability; as, for instance, the Kent coal. It was there demonstrated that by their process fuel could be economically made equal in value to the large coal worked in the same seams.

The briquetting method of utilising coal slack required costly machinery and plant, and the slack had to be transported to the briquetting factories. The concreting process, on the contrary, enabled the simple machinery and plant to be taken to the dumps of slack, thus saving handling and transportation. The concreted fuel was manufactured *in situ*. Further, it was submitted that a better fuel was produced.

USES OF MAGNETIC SEPARATOR PULLEYS.

MAGNETIC separator pulleys have been put to work in an increasingly large number of industries during the past 10 years. They are useful wherever it is desired continuously to remove the magnetic content from non-magnetic bulk material. For example, they are used with success in removing pickheads, coupling pins, &c., from coal passing to a crusher which would be damaged by the entrance of such material. They are used for similar purposes at phosphate rock mines and quarries. In the production of sulphite fibre paper stock, they are used to remove scrap iron and steel from the wood chips before these are delivered to the sulphite tanks. They

FIG. 1.—PRINCIPLE OF MAGNETIC SEPARATOR PULLEYS.

are also used in the production of cement, gypsum, limestone, clay for terra-cotta manufacture, as well as in the freeing of grain, spices and tobacco from bits of iron or steel before grinding. They also find employment in city refuse-disposal plants, for removing tin cans, horse-shoes, nails, &c., from the worthless material.

Magnetic separators are in use in a large number of sugar plants to remove iron rust or iron oxide from animal charcoal, which is collected by it while passing through the ovens and being baked. This baking process is necessary to eliminate from the charcoal the impurities which it has absorbed from the sugar. The magnetic material is especially prevalent after the retort has been repaired. Under ordinary conditions, the magnetic pulley is energised only part of the time, two weeks out of a month or so, this being sufficient to keep the iron oxide out of the bone charcoal, so that trouble with iron colouring in the sugar is prevented.

The use of powdered or pulverised fuel has been extended, and this has led to the need of magnetic separators in cement plants, steel plants, power houses, and many other kinds of plants. Coal, as delivered to the milling plant, always contains an astonishing amount of iron in the form of bolts, nuts, rivets, nails, bar iron, railroad spikes, mule shoes, &c. Any of these materials entering the crusher or pulveriser might result in damage to the machine, with consequent delays in operation.

This foreign magnetic material can be entirely eliminated by the use of a magnetic separator located at some point ahead of the crusher. When the material passes over the separator pulley, which contains the magnet, the magnetic material is attracted and held firmly against the belt, and remains in contact with the belt until it leaves the magnetised zone, which is at some point beyond the under side of the magnetic pulley. The iron drops from the belt after it leaves the pulley, and is delivered to suitable boxes by means of a chute, the coal continuing on its course.

The pulley is magnetised by passing direct current through windings in the interior of the pulley.

In a letter to the editor, Mr. A. C. Daman states that in Colorado hundreds of tons of tungsten concentrates and middlings are annually treated over the Wetherill magnetic separator. In some cases, concentrates have been increased from 40 to 65 and 70 per cent. tungstic acid, and where pyrite is associated with ferberite, magnetic separation is indispensable.

During the last three or four months the writer had tested hundreds of tungsten ores magnetically, and success was obtained on practically all of them. It was proved that the magnetic separation was a commercial success, and in several instances the only salvation in saving the values.

ELECTRIC SMELTING OF IRON ORES.

A RECENT issue of the *Jern-Kontorets Annaler* reproduces in a slightly abridged form a Memorandum drawn up by Mr. J. A. Leffler, in which he investigates a proposal put forward in March, 1916, by the Committee appointed by the Administration of the Association of Swedish Technologists to install electric furnaces in the North of Sweden for smelting pig-iron. The Committee recommended the installation of four plants, with six furnaces in all, to produce 65,000 to 70,000 tons of pig-iron per annum, using from 110,000 to 120,000 tons of ore and about 25,000 tons of charcoal.

In his investigation the author makes, among others, the assumption that to smelt one metric ton of pig-iron from the Luleå or Gellivare ores, 1·6 ton of ore and 0·4 ton of charcoal are required, and 0·272 KW.-year of electrical energy. As explained by him in detail, such a low consumption of energy can only be attained by installing four furnaces of a total of 9,000 KW., one as a stand-by and three working continuously, as this would make it possible to utilise 92 per cent. of the purchased power, while with one furnace only the useful percentage would only be 83 per cent., which is the average result attained during the three years' working in 1913-15 at the *Jern-Kontorets* experimental plant at Trollhättan. There must be, however, a misprint in the figure given for the output of this plant for 1915; it should be 7,502 tons, instead of 7,052 tons, to make the author's calculations correct. The capital outlay at Luleå would be about £85,833 for the plant itself, and about £20,833 for dwellings for officials and workmen, while for Gellivare the corresponding figures would be £94,444 and £23,333 respectively. There would be 6 officials and 75 workmen, with their foremen, and the assumed output at each place would be 30,000 metric tons per annum. For the cost of production of one metric ton of electric pig-iron, the author submits the following estimates:—

	At Gellivare.	At Luleå.
1·6 metric ton of ore*	£0 18 3	£1 1 7
Limestone	0 0 8	0 0 5
0·4 metric ton of charcoal... ...	1 0 10	0 18 1
0·272 KW.-year	0 14 5	1 0 4
Electrodes	0 1 10	0 1 8
Repairs and upkeep	0 3 8	0 3 4
Wages	0 6 6	0 5 5
Management and sundries ...	0 2 3	0 1 11
Royalty	0 1 5	0 1 5
Sinking fund	0 3 7	0 3 3
Rents...	0 5 9	0 5 5
Carriage to Luleå	0 4 10	—
Total cost...	4 4 0	4 2 10

* 50 per cent. of ore and 50 per cent. briquettes.

The freight from Luleå to Gävle, and unloading the iron into railway trucks, would cost another 4 kr., say, 4s. 6d. per ton. It would thus be seen that the northern pigs would cost at Gävle about £4 8s. per ton, and, therefore, could not compete with the pig-iron obtainable there from the blast furnaces at 65 to 70 kr. (about 72s. to 77s. 6d.) per ton for basic, and at 70 to 75 kr. (about 77s. 6d. to 83s.) per ton for acid open-hearth pig-iron.—*Iron and Coal Trades Review.*

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THE SPRING LAKE MARINE RAILWAY.

In the *General Electric Review*, Mr. Jacob A. Harman, chief engineer, Elliott & Harman Engineering Co., Peoria, Ill., gives an account of the Spring Lake Marine Railway, which is a system designed to serve the same purpose as a marine lock, but to cost less, and to be maintained at a lower expenditure.

The railway, located in the Illinois River valley about 30 miles below Peoria, was built by the Spring Lake Drainage and Levee District, an authority organised under the Laws of Illinois, for the purpose of reclaiming about 14,000 acres of land that was subject to overflow by the Illinois River. The district, as organised, included a body of water known as "Spring Lake," which was shut off from communication with the Illinois River by the levee or dike constructed by the Drainage District.

It was at first contemplated that a lock should be constructed for the purpose of communication between the river and the lake, but the cost of the construction and maintenance thereof would have been burdensome, and approval was obtained for the construction of the marine railway. The electric power for operating the mechanism is supplied from the power plant of the Canton Gas & Electric Co., at Canton, Illinois. The transmission line, about 20 miles long, is a 13,000-volt line, and also supplies electric current for the Banner and the Spring Lake Drainage Districts pumping plants. The railway and the pumping plants were designed by and constructed under the supervision of the Elliott and Harman Engineering Co., consulting engineers.

In general, the marine railway consists of an incline track leading up each slope of the levee to a turn-table located on the summit of the embankment. A cradle, or boat carriage, is

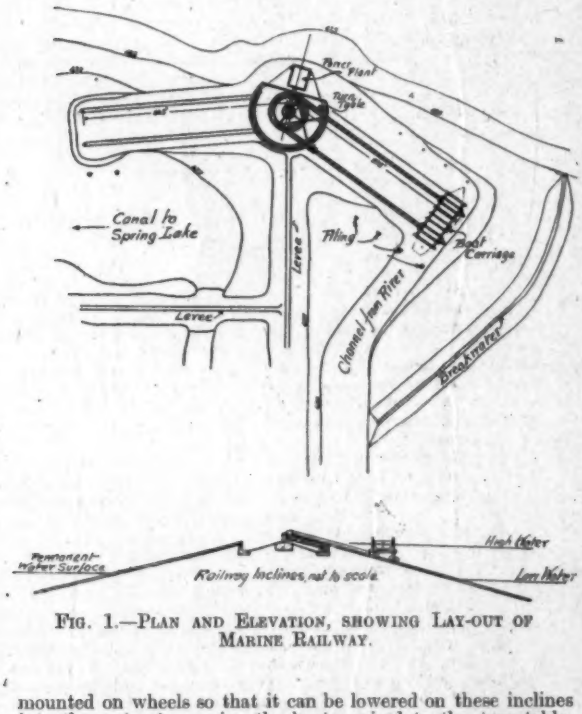

Fig. 1.—Plan and Elevation, showing Lay-out of Marine Railway.

mounted on wheels so that it can be lowered on these inclines into the water to receive the boats, raised to the turn-table, rotated thereon, and lowered to the water again on the opposite side of the levee, keeping the boat in its natural position throughout all these operations. An electric hoisting engine for hoisting and lowering the boat carriage, and an electric swinging engine for rotating the turn-table, are housed in a reinforced concrete building alongside the turn-table.

The marine railway mechanism is designed on the basis of handling as a maximum load a flat-bottom barge, or power boat, 24 ft. wide, 120 ft. long, and having a draught of 3 ft. 6 in.; the cradle, however, as designed is sufficiently wide to accommodate shorter boats of a maximum width of 28 ft. Smaller boats, barges, and launches can also be handled. Each incline consists of two standard gauge railroad tracks, laid parallel, and spaced 50 ft. centre to centre, the gradient of the tracks being 10 per cent. These tracks extend from the turn-table down into the water on each side of the levee to a depth sufficient to have 4 ft. of water over the floor beams of the boat carriage at the low-water stage. The rails used for all tracks are 120-lb. standard T-rail sections, and are laid on creosoted ties. The circular rails on which the turn-table moves are mounted in a concrete pit, 115 ft. in diameter, upon a heavily reinforced concrete foundation of the slab type.

The cradle, or boat carriage, is a steel structure mounted on wheels. The trusses are 80 ft. long and 10 ft. high, with a clear opening between them of 30 ft. The fixed floor beams are arranged in pairs, and between each pair is mounted a heavy movable beam which can be adjusted to fit up snugly against the bottom of the barge or boat in its natural position. These movable floor beams are hung on heavy threaded rods, which extend upward through the upper chord of the truss, at which point the rod is suspended from the top of the truss by means of a split nut with four handles resting on a short coil spring. There is also provided a winch adjustment for each of these rods for raising the beams rapidly to position, after which the split nut is closed and the beam is brought up close by the use of the nut. This boat carriage is supported on two specially constructed eight-wheel trucks of a heavy type, the mounting being arranged so that the

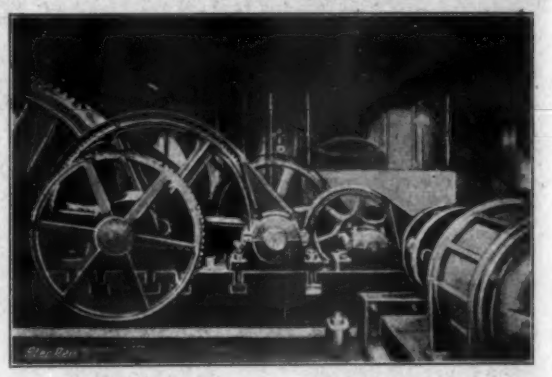

Fig. 2.—Induction Motors Driving a Hoist and a Swinging Cable Drum.

floor of the boat carriage is always in a horizontal position. Each of these trucks is provided with special draw bars, to which are attached the steel haulage cables used for raising and lowering the boat carriage on the inclines. Each truck is also provided with a system of brakes which may be set by hand, and which are so constructed as to be set automatically by a coil spring whenever the tension of the haulage cables is released.

The power and hoist equipment consists of two electrically-driven hoisting drums, one for raising and lowering the boat carriage on the inclines, and the other for rotating the turn-table. The main hoist drum is driven through a train of spur gears by a 75-h.p. (intermittent rating), 600-r.p.m., 440-volt, 3-phase, 60-cycle, slip-ring type induction motor with a reversible drum type controller mounted on the operating platform. The travelling speed of the main haulage cables is approximately 16 ft. per minute. The brake drum is 10 ft.

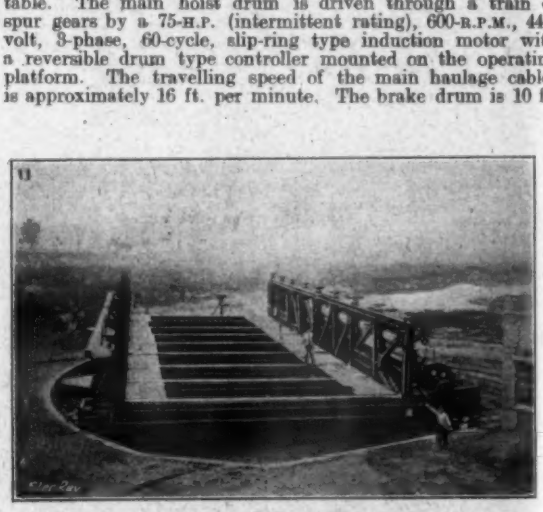

Fig. 3.—Boat Carriage on Turn-table.

in diameter, with a 14½-in. face. This brake is applied by means of a system of heavy weights and levers, and is released by raising the weights with a drum and wheel hoist mounted on the operating platform. A pawl and ratchet device on this hoist keeps the brake mechanism in the released position after the weights have been lifted by the hoist. This pawl and ratchet device may be tripped, thus applying the brake on the main drum, by four independent agencies: (1) By means of a foot trip, mounted on the operating platform; (2) by means of a ratchet device, which engages the teeth of the large gear when the cable starts to unwind, thus automatically setting the brake; (3) by a centrifugal governor, which automatically sets the brakes should

the speed of the boat carriage exceed the predetermined speed of 16 ft. per minute; and (4) by an electric solenoid device, which automatically sets the brake in case the supply of electric current should be interrupted. Device No. 2, which automatically sets the brake when the cable starts to unwind, is made inoperative when lowering the boat carriage by means of a foot pedal on the operating platform.

The turn-table swinging engine consists of a drum driven by an 18-H.P. induction motor with a reversible drum-type controller mounted on the operating platform. The brake on this engine is operated by a hand lever mounted on the operating platform, and the travelling speed of the cable, which is hitched to the outer trucks of the turn-table, is 20 ft. per minute.

There are three special indicators to aid in the operation of the apparatus.

In conclusion, the following data concerning the marine railway will be of interest:—

Maximum lift of railway, 27 ft. vertical.

Estimated maximum weight of boat carriage and boat, 800,000 lb.

Largest boat that it is calculated to carry, length 120 ft., width 24 ft., draught 3½ ft.

Distance between centres of incline tracks, 50 ft.

Slope of tracks, 1 ft. in 10.

Estimated maximum pull on haulage cables, 100,000 lb.

Speed of boat carriage, 16 ft. per minute.

THE ELECTROLYTIC TREATMENT OF ZINC ORE.*

At a recent meeting of the American Chemical Society a paper was read by Mr. E. E. Watts on this subject. He said that the war had given a great impetus to the zinc industry, and much attention had been directed to the treatment of complex ores by hydrometallurgical and electrolytic processes.

In 1912 and 1913, at the School of Mining, Kingston, the writer experimented with zinc ore from the Sullivan Mine, of Kimberley, B.C. The ore was a dense complex sulphide.

Tests were conducted to determine if it was possible to obtain metallic zinc by the electrolysis of solutions of zinc bisulphite. The deposition of the sulphur and zinc sponge, and the evolution of hydrogen sulphide made this electrolysis impossible. Attempts to obtain metallic zinc by electrolysis of solutions of zinc sulphate to which zinc sulphite precipitate was periodically added showed that in the presence of sulphurous acid or zinc sulphite successful electrolysis was impossible.

Tests were conducted in which the zinc sulphite precipitate was first roasted to oxide before charging at the anodes in a zinc sulphate electrolyte. Successful results were obtained. The zinc deposited in a good plate, and the electrolyte was maintained by the addition of the roasted sulphite. To free the bath from particles of precipitate that might attach themselves to the deposit, to place the roasted precipitate at the point in the bath where the sulphuric acid was regenerated by the electrolysis, and to decrease, if possible, the decomposition voltage by allowing the roasted precipitate to act in part as anode, the crude zinc oxide obtained by roasting the zinc monosulphite precipitate was placed in bags at the anodes of the electrolytic cell.

From the foregoing experiments the following conclusions were deduced:—

Lead forms a satisfactory anode, and copper, zinc, and aluminium form satisfactory cathodes.

With current densities of from 2.5 amps. per square decimetre to 4.5 amps. per square decimetre, a current efficiency of approximately 100 per cent. can be maintained.

Depending upon the current density, the voltage varies from 3.5 to 6 volts.

The extraction of zinc from zinc oxide varies from 95 to 100 per cent.

The process, as outlined, was patented, and was developed for the treatment of high-grade zinc ore. The process has been referred to as the Watts Process.

The high-grade zinc product for charging to the electrolytic cells may be roasted zinc concentrate, impure or refined zinc oxide, or zinc dust. The advantages of such a treatment are:—

1. The solution is kept small in bulk and the solution and tanks serve at once for leaching the ore and for electrolysis.

2. The acid generated at the anode is immediately used up at the point at which it is generated, and at the point where it is most concentrated, and hence most active. Thorough extraction is thereby obtained.

3. The bath is automatically kept at constant composition and purity, zinc goes into solution with the relative exclusion of impurities.

4. The zinc content of the solution is kept constant, and high-current efficiency is therefore maintained.

5. The conditions are fulfilled for obtaining a good cathode deposit.

6. The residues from electrolysis may be further treated for the recovery of other metals.

The writer became connected with the Weedon Mining Co., and in August, 1915, work was started on an experimental plant at Welland, Ont.

With two anodes per tank, with the compartments surrounding the anodes, and with a current of 950 amperes per tank, corresponding to a current density of 12.5 amperes per square foot, good results were obtained.

Several expedients were tried for keeping the solutions cool when employing higher currents, but the heat resulting in part from the electrolytic resistance and in part from the chemical reaction at the anode, made higher currents impracticable with this form of tank.

Considerable difficulty was also experienced with the compartments, for the canvas used as a diaphragm material developed into a serious weakness, and required constant attention and repairs.

In general, the laboratory experimental results were attained, but the operations did not permit of a sufficient margin for profit. The company did not see its way clear further to perfect the details of the process on a large scale, so the plant was closed in August, 1916.

When producing zinc at the rate of 8,000 lb. per month, the cost of producing zinc was as high as 18 cents per lb. plus the cost of the ore. On the basis of a steady production of 60,000 lb. per month, the writer estimated that the cost of producing zinc electrolytically should be 4 cents per lb. when power was available at $14 per horse-power year.

In a large plant the above costs would be considerably reduced. About 30,000 lb. of zinc were produced, which averaged 99.95 per cent. zinc.

The work showed that it was possible to operate upon a commercial scale, but that weakness existed in the diaphragm material, and that many of the mechanical details could be improved. The process possessed advantages over other processes with respect to extraction, current efficiency, and necessary purity of the electrolyte, for good results were obtained in solutions in which ordinary electrolysis is impossible. With a satisfactory diaphragm it seemed probable that a higher acid electrolyte could be used with a correspondingly high current density, and that future development would be along this line.

* *Metallurgical and Chemical Engineering.*

THE THERMOCOUPLE NICHROME-CONSTANTAN.

During the course of an investigation by R. W. Woodward and T. R. Harrison, at the Bureau of Standards, of the temperature distribution in cooling rails of various sections, it became necessary to use thermocouples under unfavourable and peculiar conditions. These required that the couples should be small and remain constant in their calibration while enclosed to a depth of 4 in. in holes of 6 mm. diameter in steel at 1,000° C. in an oxidising atmosphere without the use of porcelain insulators in the usual manner.

After a trial of several base-metal elements, a couple of No. 18 nichrome and No. 12 constantan was found to answer the purpose very satisfactorily. These wires had a single asbestos wrapping, and were further protected by covering with a thick mixture of kaolin and sodium silicate, winding with asbestos cord, and again smearing with a thinner mixture of kaolin and sodium silicate.

A life test of this combination of thermo elements was made, together with others of nichrome-constantan and iron-constantan.

The couples of nichrome-constantan maintained a very nearly constant calibration—to within 10° C.—during their life, and could be relied upon to 10° C. as long as there was a metallic electrical circuit, whereas the iron-constantan couple had a practically uniformly diminishing E.M.F. In all cases it was the contantan wire that failed, by oxidation and becoming so brittle that it readily broke; the nichrome wire never became brittle, and showed no considerable oxidation.

The couple nichrome-constantan showed a remarkably high E.M.F.; the calibration curve was very nearly linear, and showed no departure from a smooth curve. The same calibration was found to hold good to within 1° up to 1,000° C. for other couples made of wire from the same lot, but it would probably be different for wires from other lots or other wires from this lot.

Couples were constructed of this combination for use in the investigation referred to, and to date had been found to give very good service.

For use in the air, therefore, to 1,000° C., even when only incompletely protected, these data and subsequent experience showed that the thermocouple nichrome-constantan would maintain its

Calibration of Nichrome-Constantan.

Temperature, Deg. C.	E.M.F. Millivolts.	Temperature, Deg. C.	E.M.F. Millivolts.
108	4·92	632	37·4
204	9·90	842	52·2
292	14·9	1,033	66·3
434	23·8		

constancy to within 10° C. (18° F.) until nearly completely oxidised. The E.M.F. of this couple was high, 63·8 mv. at 1,000° C., as compared with iron-constantan, 57·5 mv. at 1,000° C.; nickel-constantan, 27·2 mv. at 1,000° C.; nickel-nichrome, 28 mv. at 1,000° C.; and cobalt-constantan, 39·5 mv. at 1,000° C.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Employment of Disabled Soldiers.

It was with regret that I read your paragraph on the employment of disabled soldiers in the Review of July 27th. You "note with surprise" that "a municipal undertaking is advertising for invalided young officers to act as switchboard attendants at 37s. a week." Further, you "cannot help feeling that this offer borders on an insult to men . . . who have received a liberal education, and who have occupied positions of trust and responsibility."

May I say quite frankly that this paragraph is an insult to every switchboard and sub-station attendant in the country? Does not the switchboard attendant hold "a position of trust and responsibility"? And how many of these attendants have not received an education equal to, if not better than, the average young officer? The majority of sub-station and switchboard attendants are as conversant with their work, and quite as intelligent and well educated, both socially and technically, as 75 per cent. of the officers in the Army to-day. From my own experience of over eight years I consider the average station attendant to be far better educated and to hold a far more responsible position than 90 per cent. of the men in other trades drawing the same salary. It must be remembered, too, that education and efficiency are not by any means the only roads to promotion in the Army; recent disclosures prove this.

As a constant reader of your valuable paper, I consider you would be rendering a greater service to the country by urging the importance and responsibility of every grade of power and sub-station worker, from the shift engineer downwards, than by belittling the responsibility of men who are silently serving their country controlling, day and night, the intricate copper networks forming the arteries through which the life blood of the munitions industry flows; or than by applauding the introduction to responsible positions of women, many of whom, previous to the war, never had more responsibility on their shoulders than the keeping of a toy dog.

E. M. F.

I have read with hot indignation your paragraph on page 87, protesting against officers being insulted by the offer of work as sub-station attendants at 37s. per week.

The theme of the article is sound, but what have sub-station attendants done to earn what the Editor of the Review would, in other circumstances, call "a gratuitous slur" which runs through the paragraph? Had the lines been written by an officer one would have been tempted to put it down to snobbishness, but these gallant fellows are at least not guilty here.

In my experience of sub-station work, I have gone on shift with more than one B.Sc. The chief engineer of one of our largest electrical railways was once, I believe, a sub-station attendant. Yet here is the Editor of the Review insinuating that we are all illiterate nonentities! True, many a hundred subscribe to the E.R., but perhaps it is because they like its pretty blue cover.

The fact that women can do the work does not render it less skilful in the operating; was the discovery of radium less important because a woman gave it to the world?

A good shift engineer, Sir, is worth his weight in gold, and companies who employ the inferior operator are asking for trouble. The best automatics will fail at times, and it is at this moment that a good man (e'en though he be not an officer) will save his firm as many hundreds of pounds as he earns shillings per week. The cheaper and inexperienced man (or woman) rushes about in confusion, with sudden death dogging his footsteps the while. The insult in question lies in the *wage*, not the work, that this municipality is offering to these gentlemen.

Teddington, *August 4th*, 1917. Alfred Bridges.

[We fully appreciate the point of view of our correspondents, and admire the ability with which they plead their cause. We do not admit, however, that, when read without personal bias, our note can be made to bear the construction that they place upon it. For one thing, we said nothing at all about shift engineers—why drag them in? The question at issue is simply whether the post of switchboard attendant, at a salary of 25s. a week + a war bonus of 12s., is a fit and proper one to offer to men who have borne His Majesty's commission, and have suffered in defence of their country. Is this the best that we can do for them?

The Council and the Local Sections of the I.E.E., as well as the L.C.C. and other public bodies, have decided that switchboard attendance is a suitable occupation for disabled soldiers and sailors who have had a few weeks' training; it stands to reason, therefore, if these authorities are right, that it does not call for the possession of those qualifications which are looked for, and should be found, in their quondam officers. We may cite also the Memorandum of the Reserved Occupations Committee, which was endorsed by the I.M.E.A., and recommended the employment of women in this capacity (see Elec. Rev., February 23rd, 1917, page 212).

As for the skilled and educated men on whose behalf our correspondents so ably intervene, we had not the least intention to reflect upon their merits; our past records show that we have always striven to raise their status and their salaries—the A.E.S.E. was initiated through our columns and with our aid—and we are convinced that many of them are far too good for the jobs (and the pay) that they get.—Eds. Elec. Rev.]

Prospective Engineering Policy in France.

Belloc has described her villages as the pinpoints on which the lace work of France is stretched.

The metaphor is delightfully appropriate. France has always striven after a peculiarly effective centralised system. Noticeable originally in her national policy, it has evolved a natural corollary in the grouping of her village communities.

Miserably ruined as they are, these clusters of razed brick and mortar in the area evacuated by the enemy last spring, form a strikingly definite object lesson to us who are fighting amidst the debâcle.

Your mention of M. Laurent's view on the prospective electrical energy of the country after this war, in your issue of July 13th, may make these lines of interest to your readers.

The enemy has taken special pains to totally destroy the original power network that fed the villages from large central stations established in the proximity of provincial towns in the pre-war days.

The country side is littered with the shattered concrete masts that directed electrical energy from point to point.

One thing is evident. France cannot build on the old foundations. She must conceive and carry out a totally new scheme, and this, I fear, will in a large measure impede immediate construction of power plant and supply.

We electrical engineers have naturally come to accept our scientific production as a primary source of vitality in the national life. Such a conclusion is justified, but only when the national life *exists*—i.e., when community is a *fact*, and definite symbols, such as houses, stand for the *verification* of that fact.

The problem that confronts the France of to-morrow is primarily the regeneration of her existence.

Will she adopt her intensely centralised plan of hitherto, or will she follow, say, on English lines, and have, not only the village, but also a formidable scattering of outlying farms and factories?

It is a question that will require very careful consideration and the boldest handling. The allotment of land fairly—on the basis of individual pre-war prosperity or on the numerical strength of remaining citizen families in proportion to the devastated area—is a trial that the strongest of nations may fairly quail from.

The engineer's *rôle* in the near future will be, not a fevered building for building's sake, but rather one of mature thought, out of which he will be enabled to form some idea, not only definite, but also one capable of a limitless and, above all, a *quick* expansion.

This is a task that, under the present abnormal conditions, has no precedent to guide its ultimate conclusion.

We have before us a wonderful scope, and it is our duty not only to fight with France, as we are doing to-day, but also, when the time comes, to strain every nerve to help her in her future policy. Taking account of the intimate local knowledge (often bitter) of her countryside that this war has given us, we must endeavour, as her ally, to help in adjusting—to the best of our ability—this policy, within the bounds of latest scientific law and probability.

The opening-up of your columns to matters French is, if I may say so, a big advance in an essential direction.

R. C. Andersen.

B.E.F., *July 30th*, 1917.

[Our correspondent's letter is very welcome, and we cordially agree with his views; we hope that our alliance with France in war time will persist as partnership when peace returns. May we point out, with reference to the last paragraph of Mr. Andersen's letter, that "the opening-up" of our columns to French affairs is no new departure? For many years past we have from time to time reviewed the progress of electrical developments in France, and we have published many illustrated articles on French electrical undertakings.—Eds. Elec. Rev.]

The Perils of Jesting.

Mr. Perren Maycock's letters on your reviewer's remarks have brought tears to the eyes of many. They remind me of a conversation with my friend Mr. Macpherson, when I repeated the old tag that a Scotchman jokes with difficulty. Seeing his anger, I added that the statement was silly enough, for many of my most witty friends were Scotch. Mr. Macpherson glared at me, inflated his chest, and, with emphasis, replied: "Sir, no Scotchman ever lowers himself by such a contemptible act as a joke." As the poet has said:—

> "Beware of a jest, for he is not blest,
> Who jokes with a friend that is dour;
> The man who is wise everlastingly tries
> To hold up a face that is sour."

That rule is inviolate in the electrical industry, at any rate, on its official side. One no more should jest in a book review than at an I.E.E. meeting. Shortly before his death, Mr. Robert Hammond gave an address at a Local Section of the I.E.E., in which he related his early experiences. It was all very good, and had it been reported in the I.E.E. *Journal*, the number would have remained in a handy place long after the other volumes had received their merited promotion to the attic. But, alas! Mr. Hammond had the fatal defect of humour and humanness, and the speech is lost, for ever.

Mr. Maycock deserves reparation for his moral and intellectual damages. Why should not the Editor permit him to review the next edition of his book? At any rate, we would feel sure that the reviewer had read it.

Jack Point.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A Novel Soldering Iron.

A copper-pointed soldering iron which is heated by the contact resistance with two carbon electrodes, or more specifically by the white heat produced at the electrode tips, is being manufactured by the CLEMENS ELECTRICAL CORPORATION, of Buffalo, N.Y. The copper point is brought in contact with the electrodes by releasing a catch on the spring. The iron may be heated ready for use in

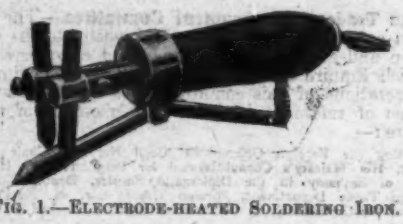

FIG. 1.—ELECTRODE-HEATED SOLDERING IRON.

less than two minutes, it is claimed. The outfit is designed for tinning, running seams, and soldering low-fusing metals such as zinc and lead. Two sizes are made, one requiring 60 watts and the other 150 watts. Any special pointed copper can be attached to this soldering iron. To heat these irons only 5 to 7 volts is used, transformers being provided to give this low voltage.

Gravity Cell with Small Local Action.

In a communication to the Société Internationale des Electriciens, M. Ch. Féry discussed the causes of the irregular wasting of the zinc rods in salammoniac cells, and stated that the more rapid consumption of the upper part of the rod was due not only to the oxygen of the air, but still more to a secondary electrolytic action between the parts of the rod which were immersed in two dissimilar liquids. As the result of experiments, the author concluded

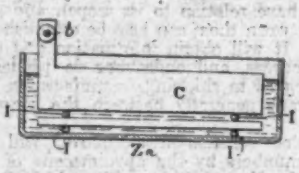

FIG. 2.—SECTION OF GRAVITY CELL.

that the best plan was to use a flat zinc plate lying horizontally at the bottom of the cell, as in fig. 2, supported on insulating rods l, l. The carbon electrodes resting on similar rods are L-shaped plates, on edge, joined together with a screwed metallic rod *t*. A cell of this type, having a zinc plate of 100 cm.² (15·5 sq. in.) and 10 carbon plates gave on short circuit a current of 2·5 amperes.

"Roller" Lock-Nut.

Of the designing of new forms of lock-nuts there would seem to be no end; the latest to come under our notice is one that has recently been introduced by the ROLLER LOCK NUT CO. of 61,

FIG. 3.—ROLLER LOCK-NUT, PART SECTION.

Broadway, New York, and which has certainly the feature of novel design. In the top of the nut is a recessed section, in which is attached a piece of thin spring brass bearing on one end a hard roller. When tightening the nut, this roller is forced by the reverse motion of the bolt back into the recess. On the other hand, any motion of the nut backward off the bolt draws the roller forward against a projection in the wall, tending to hold it tighter. While the nut is thus claimed to be self-tightening under the usual conditions of vibration, it can, when desired, be loosened by a spanner. Just beyond the projection in the track of the roller is a deep pocket; when a spanner is applied sufficient force is exerted to carry the roller over the projection into this pocket, where it is out of the way and does not interfere with the free movement of the nut. Another advantage claimed for the new lock-nut is that as it contains its own locking device, only one nut has to be employed, thus allowing the use of a shorter bolt than when two nuts are necessary. At present the nut, which is stated to have been adopted by a number of leading American engineering concerns, is only being supplied in sizes for U.S. standard screw threads.

THE MUNICIPAL ELECTRICAL ASSOCIATION AND ELECTRICITY SUPPLY REORGANISATION.

A CIRCULAR letter has recently been issued to members of the I.M.E.A., in which the Council state that they feel they should give to the members as much information as possible regarding their actions in connection with the future of the electrical industry as now being dealt with by Committees appointed by the Board of Trade and otherwise.

It is a matter for great regret that full information cannot be imparted at the present time, owing to the withholding by the Government of the report of the Board of Trade Electrical Trades Committee (Sir Charles Parsons's Committee) and the interim report of the Coal Conservation Sub-Committee of the Reconstruction Committee.

The Council are strongly of opinion that pressure should be brought to bear with the object of obtaining the immediate publication of these reports. This would release evidence which has now to be preserved in confidence, and enable more open discussion by those most concerned and best informed.

The I.M.E.A. Council, on November 1st, 1916, agreed several resolutions regarding the appointment of a Central Board of Control or Commission to take over the whole of the duties at present exercised by the Board of Trade, Local Government Board, Home Office, and other Departments, so far as they relate to the administration of the Electric Lighting Acts; such Central Board to have full powers, but not to be authorised to own or operate electricity works.

The new Central Board will be a progressive body with the interests of the industry at heart, and should, therefore, have complete control—subject to Parliament alone—over all such matters as the granting of powers, approval of rates of charge, formulation of rules now drawn up by the Board of Trade, &c.

It was specified that members of the Board should be whole-time officers, who should sell out all securities owned by them in any electrical undertakings, so that the confidence of the country may be furthered by the assurance that those in control are entirely disinterested.

The Council have come to the conclusion that to secure the most economical production of electricity, generation in the future must be by large power stations, though not necessarily in every instance by new super-stations; that the large power stations can best be controlled and operated by District Boards consisting of representatives appointed by the present statutory undertakings (both local authority and company), and that the distribution shall remain with present undertakers, subject to suitable safeguards to protect consumers.

The Council are fully aware that the idea of transferring to a District Board some of the powers now exercised in regard to the generating side of the business may not commend itself to some existing undertakings, but they are convinced that in order to secure a large and economical supply of electrical energy, it will be necessary to adopt centralised generation with large units of plant, and the interests of all parties concerned are best met (so far as generation and transmission are concerned) by advocating joint control and operation by District Boards.

In the event of the status or remuneration of an official of any undertaking being adversely affected through the formation of a District Board, such an official shall be entitled to compensation.

A report of the Lancashire and Cheshire Linking-up Committee will be published within a few days, the details of which will prove of considerable interest in the fuller consideration of schemes for supply throughout the country.

A resolution was transmitted to the President of the Board of Trade in accordance with the instructions of the annual general meeting; it is a matter of great regret that, although three additional members have been added to the Committee, these additions have been made without reference either to the I.M.E.A., which represents the municipal electrical interests, or to the individual municipalities concerned. The Council feel that further attempts to get the representation on the Committee adjusted at the present time would be futile, and do not, therefore, propose to take further action at present.

As regards the giving of further evidence, Mr. Faraday Proctor having been deputed to give evidence for the Association, it is desired that any members having points of importance to be

brought forward which have not been otherwise dealt with, should send particulars of the same to him immediately, with a copy or draft of information prepared for witnesses.

It will be realised that many points have already been dealt with by the Association's witnesses before Sir Charles Parsons's Committee, and by the witnesses of the Association of Municipal Corporations.

At the annual general meeting of the I.M.E.A., on June 22nd, several members stated that plant extensions by municipalities were being refused by the authorities while power companies appeared to be favoured in that matter. The Council will be glad if members will advise them of specific examples, which have come within their personal knowledge, of undue obstruction experienced by local authorities, and of undue assistance given to power companies in connection with extensions of plant or mains, so that the information may be tabulated with a view to taking further action on the matter.

WAR ITEMS.

Trading with the Enemy.—The "London Gazette" for August 3rd contains further lists of persons or bodies in a number of countries with which or whom trading is prohibited:—Netherland East Indies, Norway, Spain, Sweden, Venezuela, &c.

Copper Shortage in Germany.—Reuter's agent at Amsterdam quotes the *Koelnische Volkszeitung* to the effect that the German Government are requisitioning lightning conductors on account of the copper and platinum from which these are made.

The First Problem.—Reconstruction after the war was the subject of the inaugural address given by Mr. Herbert Samuel at the Oxford University Extension summer meeting. He said that an increased national production of wealth would be a prime necessity. It was clear that restrictions on the output of either workpeople or of machines would be more than ever injurious, but if they were to be removed it must be with the assistance of Labour, and some alternative means must be provided to give that protection to the worker which the restrictions were designed to secure. How to achieve this was the first of our problems.—*Times.*

Education After the War.—Lord Haldane, speaking at a conference at Oxford on educational reconstruction, said that the end of the struggle would not find society as it was when the struggle began. He looked upon education as the most important element in reconstruction. Let them begin with education, take it as their foundation, and social problems would solve themselves. Education was a thing of tremendous significance. One of the great problems of Labour was how to make Labour interesting; they had too little imagination about the grievances of the labourer. One of his great grievances was that his toil was mechanical and dull. With the march of science marched also the machine, which took away very much of the dull and monotonous work. The higher the application of knowledge to industry, and the more thoroughly science penetrated their industrial organisation, the more closely they would get to the time when every man, even the great bulk of those engaged in manual labour, would realise that brain power was as necessary as muscle power.

As reported in the *Times*, Lord Haldane said he was deeply convinced that in education, as in most other things, unless there were devolution—devolution to those who were able and willing to work in the various localities—they would not make very much progress. Local self-government was their principle there as elsewhere. This war had shown what the nation could accomplish when we were put to it, and we could accomplish far more for education if we had a little more orderliness in our composition. This was the time to think. Peace would come some time. It might come soon and it might not, and it might be sudden. The risk we ran was that before peace came we might not have thought out how to deal with the great problems which would be upon us.

The Work of Reconstruction.—Sir G. Cave, addressing the House of Commons respecting the setting up of the Ministry of Reconstruction, said (according to the *Times* report) that there was important and vital work for the Minister to do. The more he saw of the machinery of the war, and the more he realised the tremendous upheaval which must take place on the conclusion of peace, the more ardently he desired to take all the steps that he could to render efficient and effective the policy of reconstruction. The demobilisation, not only of the Army, but of the industrial army, would be of vital interest to the working classes. No one could think of the great bodies of men and women now employed in munition factories without being anxious as to what their fate would be if the war suddenly came to an end. They wanted a department which would charge itself with the consideration of those grave problems and would recommend to the other departments that were directly concerned the steps which should be taken.

Lord Parmoor, in a speech at Liverpool, said it was very right that even under the great stress of war we should look forward in good time to what was necessary for reconstruction in our commercial life in the future. He did not believe so much in one large general scheme of reconstruction, but that every commercial society should do what it could within its own powers and its own area to add to what might be the stream of progress which they hoped might come after the war. He was a great believer in research and study and in collective action, but if they allowed that to supersede what he called the vitalising effect of individual energy and individual enterprise, they might purchase the advantage at too high a rate. However much they might depend upon research and knowledge, there was something in the energy, the life, and perseverance of the individual on which they had relied in the past in their English commercial enterprise, and which he hoped would not be less potent and less powerful in future. Lord Parmoor thought they ought to a great extent to revert to the old apprenticeship system.—*Daily Telegraph.*

Belgian Trade: A Government Committee.—The Government has appointed a committee to investigate the means of promotion and advancement of trade and commerce between the British Empire and Belgium. In view of the importance of the operations of this committee, we give its constitution and terms of reference in full:—The members of the Committee are:—

Representing the Foreign Office:—Sir Cecil Hertslet (Chairman of the Committee), His Majesty's Consul-General for Belgium; Mr. R. Macleay, Counsellor of Embassy in the Diplomatic Service, Deputy Controller of the Foreign Trade Department, Foreign Office; Mr. M. Neville Kearney (Secretary of the Committee), of the Consular Service, attached to the Foreign Office.

Representing the Board of Trade:—Sir W. H. Clark, Comptroller-General of the Department of Commercial Intelligence, Board of Trade; Sir E. Wyldbore-Smith, Director of the Commission Internationale de Ravitaillement; Mr. Percy Ashley, Board of Trade.

Representing British Commercial and Financial Interests:—Sir Algernon F. Firth, representing the Association of Chambers of Commerce of the United Kingdom; Mr. E. F. Oldham, representing the Federation of British Industries; Mr. M. Cleminson, representing the Chamber of Shipping of the United Kingdom and the Liverpool Steamship Owners' Association; Sir R. Vassar-Smith (chairman of the Committee of London Clearing Bankers), representing the Bankers' Clearing House; Lord Faringdon, representing the British Trade Corporation; Mr. Frank Potter (general manager, Great Western Railway), representing the Railway Executive Committee.

The terms of reference show that the Committee is established for the purpose of inquiring into all matters relative to trade between the British Empire and Belgium, with a view to increase and develop that trade by every desirable means. It will be the duty of the Committee to investigate as far as possible all means to be adopted in order to attain the foregoing object. The Committee will examine into the supplies and requirements of the representative countries (in so far as they have relation to its scope), and give advice as to how trade between them can best be established, developed, and increased. It will obtain information and evidence from all available sources, and endeavour to render all possible assistance in regard to shipping, manufactures, imports, and exports, and trade generally between the Empire and kingdom.

The Committee constituted as above, will have power to add to its numbers by the appointment of such persons of experience in the matters with which it has to deal as it may think expedient, and it will also consult from time to time other representatives of commerce having special knowledge of Belgian trade, shipping, and finance.

It is particularly laid down that the purpose of the Committee shall be a general one, and that it shall not be part of its duties to foster the advancement of the trade of any particular individual or firm, nor to devote its assistance to any special branch of trade or industry except in relation to the general principles for which it is established.

The Committee will be known as "The Belgian Trade Committee." An office has been established provisionally at 39, Parliament Street, S.W.1, to which all communications should be addressed.

Exemption Applications.—At Batley Local Tribunal, exemption to October 1st was granted in the case of H. A. Wilson (28, married, in Class B 2), a motorman for the Tramways Co. The representative of the company said there were already 14 cars standing idle owing to lack of drivers.

At Rochdale, the Tramways Department appealed for E. Kershaw (35, single, Class A), motorman. Mr. Webster, general manager, said he was hard pressed for drivers, and they were working seven days a week. The claim was refused, to report on September 30th.

At Ormskirk Tribunal, Levi T. Allen (35, B 1), electrical engineer, said he was the only electrical engineer and contractor for lighting and power purposes in the town. He had had to give up his shop in Burscough Street because he could not get men. Exemption to August 31st was given, no further appeal to be made without leave.

At Rochdale, on the application of the Corporation tramways department, conditional exemption has been granted to J. Brandrick (26, C 2), electrical fitter.

Douglas (Isle of Man) Tribunal has given conditional exemption, with the assent of the Military, to A. E. Barlow (25), tram conductor, and E. W. Dobson (37), tram driver.

In an appeal at Rugby, an electrician (33), stated that, on re-examination, his classification had been altered from general service to C 1; he asked for a Munitions Order. The Military Representative said that electricians were required for the Army, and final exemption until August 15th was granted.

On the appeal of Mr. Lambert, tramways manager, Maidstone Tribunal has granted six months' exemption to E. J. Freed (40, C 2), inspector, and F. Rose (35, passed for general service), driver.

At Brighton, Mr. W. Marsh appealed for 27 men engaged on the Corporation tramways, and said that it was simply a question whether the trams were to run or not. All the men asked for were highly skilled, and it would be impossible to replace them. Each was given three months.

Before the Surbiton Tribunal, the resident engineer at the electricity works applied for exemption for a meter mechanic (27, C 2). It was claimed that he was in a protected occupation, and it was mentioned that he had been rejected, although he underwent an operation to enable himself to pass. The Tribunal ruled against the man being in a certified occupation, but the appeal was respited for further consideration.

At Grays, the electrical engineer to the U.D.C. (Mr. E. D. Long) appealed for the retention of a mechanic (31, Class A). Three months, subject to substitution, were granted.

At Coalville, on Aug. 1st, a final month only was granted to an electrician (40, B 1) appealed for by Mrs. Haydock, of Charnwood Towers.

Strood (Kent) Rural Tribunal has given exemption until October 31st to S. J. Nettlingham, electrician, appealed for by the Thames Portland Cement Co.

At Southend-on-Sea, the Military asked for the withdrawal of exemption held by an overhead wireman in the employ of the Corporation. It transpired that this was not now the man's chief employment, and the certificate was cancelled.

Conditional exemption has been granted at Swinton to an electrician (41, B 2), in business in the area.

At Canterbury, on July 31st, in the case of a coal trimmer at the Corporation electricity works, who had been exempted until substituted, it was stated that the man presented himself for the Royal Navy on July 2nd, and after being passed as a gunner-instructor, he failed to pass the doctor, and he had been discharged from the service. Mr. Blascheck (electrical engineer) had consulted with the recruiting officer, who had agreed that as a result of the recent War Office Order, the man, having been overseas, and only classified C 1, was not to be called. The man did not want to go away for substitution, and it was agreed that the existing certificate should be cancelled, so that Mr. Blascheck shall have the right to appeal again.

Leyton Tribunal has allowed exemption until December 31st to B. L. Hutchins (37, C 2), a L.C.C. tram conductor.

At Rotherham, the Corporation defended Military appeals against 12 tramway motormen and three car repairers. On it being suggested that there should be substitution, the assistant engineer said that 14 wounded soldiers had been sent, and only seven were able to stand the work. The Chairman (Ald. T. W. Grundy) expressed the hope that if substitutes were found the men most fit would be released. In reply to the Military Representative, the assistant manager said that it was impossible for females to drive cars in Rotherham. The Military appeals were disallowed and the exemptions confirmed.

Dartford Tribunal has granted conditional exemption to H. H. Lygo (27, B 1), electrical engineer at the Joyce Green power station.

BUSINESS NOTES.

Patent for Disposal.—The proprietor of Patent No. 20,111, of 1913, "Speech-reproducing apparatus," wishes to dispose of the patent or to license British manufacturers to work under it. Full particulars are given in our advertisement pages to-day.

For Sale.—Owing to the death of the proprietor, the business, plant, machinery, &c., of Messrs. Adams Bros., electrical engineers, Longton, is for disposal as a going concern. For particulars see our advertisement pages to-day.

Russian Exhibition in London.—There is being held at the Central Hall, Westminster, a Russian Exhibition illustrating the chief features of Russian economic life. The exhibition opened on Tuesday last, and will close on 18th inst. Lectures are being delivered daily. That on Wednesday dealt with mineral resources, that of yesterday considered the Russian industries, and to-day foreign trade will be the subject.

Tudor Accumulator Co., Ltd.—The annual meeting of this company was held on July 25th at 3, Central Buildings, Westminster. The board as now constituted is as follows:—Mr. B. M. Drake (chairman); Messrs. E. J. Clark, W. C. Johnson, Capt. T. Prestige, C. R. D. Pritchett, and G. E. B. Pritchett, directors; Messrs. A. B. Pescatore and E. Jacob, managing directors.

The chairman said it would doubtless be satisfactory to municipalities and others who used Tudor accumulators to know that the company was now in British hands. The directors were pleased to have been able to conclude agreements by which the services of the managers, both at the head office and the works, were retained. He referred to the very liberal war allowances, which amounted last year to no less than £5,025, and he anticipated that the company would obtain a fair share of available work now that all enemy interests, which had acted as a deterrent in the past, had been effectually removed.

Catalogues and Lists.—Messrs. Gent & Co., Ltd., Faraday Works, Leicester.—List giving illustrations, brief particulars and prices of their "Tangent" mining bells, special keys, new pattern flameproof relay with machined flange joints (lock and key), ironclad telephones and switchboards. The bells and relays are wound to Home Office and Dr. Wheeler's recommendations.

Fuller's Carbon and Electrical Co., Ltd., Woodland Works, Chadwell Heath, E.—Twenty-page catalogue of carbons for cinemas, search lights, arc lamps, primary batteries, welding, and general electrochemical purposes. More than half of the list is devoted to tabulated prices of flame, open and enclosed type arc lamp carbons. The company's new carbon works are now in full working order.

Mr. F. J. Down, 90-93, Fenchurch Street, London, E.C.—8-page pamphlet containing an illustrated description of the reciprocating track grinder supplied by the Railway Track-work Co, of Philadelphia.

Dissolutions and Liquidations.—Globe Associated Cable and Telegraphic Services, Ltd., 20 to 23, Holborn, London.—Liquidator released, July 31st, 1917.

Hall-Edwards & Emrys-Jones, medical electro-therapeutists and X-ray specialists, 141a, Great Charles Street, Birmingham.—Messrs. J. F. Hall-Edwards and M. F. Emrys-Jones have dissolved partnership. The former will attend to debts.

Economic Electric Co., electrical and mechanical engineers, 127a, Oxton Road, and Hamilton Lane, Birkenhead.—Messrs. T. W. Jefferson and T. E. Jones have dissolved partnership. Mr. Jones attends to debts, &c., and will carry on business at the Oxton Road address as the Economical Electric Co. Mr. Jefferson will carry on business at 79a, Grange Road, Birkenhead, under his own name.

Canadian British Engineering Co., Ltd.—Creditors must send particulars of their debts, &c., to the liquidator, Mr. R. G. Sidford, 20, John Street, Adelphi, London, W.C. 2, by September 1st.

Trade Announcement.—The Consolidated Pneumatic Tool Co., Ltd., have secured temporary accommodation at Egyptian House, 170, Piccadilly, W. 1, their offices at Palace Chambers having been commandeered by the Government authorities.

Bankruptcy Proceedings.—John Taylor Peddie, mechanical engineer, Exhibition Buildings, Aldwych Site, Strand, London.—Trustee released, July 6th, 1917.

Fire.—A fire occurred, on July 31st, in a large vault used as stores at the premises of the Western Electric Co., Ltd., North Woolwich, E.

Book Notices.—"Scientific Papers of the Bureau of Standards." No. 299. "An Average Eye for Heterochromatic Photometry, and a Comparison of a Flicker and an Equality of Brightness Photometer." Washington: Department of Commerce, Bureau of Standards. The comparison of lights of different colours is supposed to be based on an "average normal eye." This paper records an attempt to approximate the results of such an eye with typical colour differences by using a large number of observers. In particular, results obtained by a flicker photometer and by an equality-of-brightness photometer, with different degrees of colour differences, are compared. In terms of the Ives-Kingsbury test solutions, for which the proposed normal ratio of transmissions (with a 4-w./c.p. carbon lamp) is 1·00, the average of 114 observers gives a ratio of 0·99. By using these test solutions, results obtained on the flicker photometer by a small number of observers can be corrected so as to give normal values with a high degree of accuracy. On the average, equality-of-brightness measurements also vary in proportion to the test ratio, but erratic variations often overshadow these systematic differences. For sources having relatively high intensity in the blue, flicker values tend to fall below those obtained on the usual standard photometers, but the difference is comparable in magnitude with the uncertainty of the latter values. This publication is now available for distribution, and those interested may obtain a copy by addressing a request to the Bureau.

The July issue of the Tramways and Light Railways Association *Journal* is a special Congress number, containing reports of the papers and discussions at the annual gathering held in June.

The *Journal* of the Junior Institution of Engineers for August contains some useful hints on the rectification of faults in the working of paraffin engines, and notes on "Quantities and Estimates" by Mr. C. O. Mourant.

LIGHTING AND POWER NOTES.

Burnley.—Vehicle Charging.—The Electricity Committee has decided to provide charging facilities for electric vehicles, the price being 1½d. per unit.

Batley.—Price Increase.—The Corporation has decided to increase the price of current by 7½ per cent. on the pre-war charges for lighting, and 2½ per cent. for motive power. The new prices will operate from October 1st.

Bath.—Year's Working.—The annual report of the working of the Corporation electricity department for the year ended March 31st last, shows a deficit of £1,782, due to the increased cost of coal, wages, &c. The total income of the undertaking was £26,507, as compared with £26,490, and expenditure amounted to £14,987, as compared with £13,529, leaving a gross profit of £11,520, as compared with £12,961; interest and sinking fund charges absorbed £12,649, and, with £120 for special expenditure, made a total of £12,769, which leaves a deficit of £1,782. The total amount borrowed is £192,574, of which £105,486 has been repaid, leaving a balance outstanding of £87,088. Next year two of the earliest loans will be liquidated, totalling £50,378, which will mean a relief in the repayments item of over £3,000. The total number of units generated during the year was 2,603,945, and the total maximum demand 1,318·5 KW.

Bradford.—Proposed Price Revision.—Last week the City Council considered the proposed increased scale of electricity charges, to operate from October 1st, and referred to in our last issue. Ald. G. H. Robinson (chairman of the Electricity Committee), in moving the minutes, said he disagreed with the proposal, because the price to the flat-rate consumers had not been increased. Making deductions in respect of extra output, the increased cost in wages and salaries during the year ended March 31st, 1917, as compared with that ending the same date, 1914, amounted to £6,582, whilst £2,388 had been paid in allowances to dependents, and the increased cost of coal, after deductions in respect of increased output, had been £15,298. On top of these extra charges, which totalled something like £25,000, were other extra charges under the head of interest on loans, £3,272, and income-tax, £9,832, which meant together about £37,000. Electricity to the amount of £24,178 was supplied on the flat rate, and an increase of 10 per cent., in accordance with the proposal of the engineer—who was in the best position to judge, and was supported by the chairman and deputy-chairman—would mean an extra income on the flat-rate supply of £2,417. The "poor shopkeeper" had been spoken of. The shopkeepers consumed 362,000 units, and paid only £6,033. If they were charged according to the engineer's proposal, the extra income from them would be only £603 a year. The banks, also on the flat rate, consumed only 32,500 units, paying £541, and nobody would deny that they were well able to pay an extra 10 per cent. The 471 mill and warehouse consumers used 401,000 units, at a cost of £6,685, and surely those businesses could pay the extra £668 per year. The 464 offices, using 133,000 units, paid £2,223, and could afford to pay £222 per year extra. The 553 private houses on the 4d. flat rate consumed 101,000 units, and paid £1,693. They would pay an extra £169 on the 10 per cent. increase. He maintained that all flat-rate consumers could well afford to pay the increase. Ald. Robinson then said he was prepared to move an amendment to his own Committee's minutes, that they be referred back. Ald. J. Hayhurst asked the Council to accept the recommendation, with a variation to include the decision in regard to flat-rate consumers. The Council agreed to send the minutes back for reconsideration, passing the minutes with this amendment.

Canada.—Electric Farming in Fraser Valley.—Quite recently a number of ranchers to the south of Chilliwack clubbed together and raised $5,000 for the construction of a power line from the town's electric plant to their premises, the idea being to use electric power generated by the British Columbia Electric Railway for a variety of purposes hitherto dependent on man-power. The total investment represented in line construction, power installation, and motors was in excess of $5,000. The step taken may be attributed to the good work of Chief Electrician Porter, of the B.C.E.R. Co., Vancouver, who for the past couple of years has been demonstrating how the farmers of the Fraser Valley might lessen the hard work of husbandry by taking advantage of the company's far-flung electric system. Many farms closer to Vancouver have already done so, and now the farmers of Chilliwack district, 80 miles away, are coming into line.—*Electrical News.*

Clones (Co. Monaghan).—Street Lighting.—The Urban Council has accepted the tender of the Clones Electric Light and Power Co., Ltd., for the public lighting of the town for three years, at 5d. per unit, with a rebate of 10 per cent. should the account in any year exceed £50.

Continental.—Spain.—A concession has been secured by Joaquin Moreno Ramirez to extract water from the River Segara, and erect a hydro-electric station for the generation of electric current for industrial purposes.

Gillingham (Kent).—Price Increase, &c.—The Corporation Electric Light Committee is considering the advisability of adapting the existing Diesel plant to use tar oil. The charges for current are to be increased from 25 per cent. to 40 per cent.

Hove.—Price Revision.—The Lighting Committee has considered the advisability of revising the present charges for power purposes. The present flat rate is 1·8d. per unit, which is less than the present war-time cost of generating the unit. The Committee recommends an increase to 2d. per unit on the flat rate and by 10 per cent. on the indicator rate.

Leeds.—Wages Arbitration.—On Tuesday, last week, Mr. Forbes Lankester, K.C., sat as arbitrator between the Corporation and the General Workers' Union, the latter of whom claimed, on behalf of the workers in the electricity and gas departments, an advance of pay of 10s. per week above pre-war rates, instead of the 7s. granted. For the men it was pointed out that they worked alongside members of the Amalgamated Society of Engineers, who, as from August 1st, were to receive an advance of 12s. above pre-war rates by a recent award. For the Corporation it was held that the ratepayers were already hard pressed by war conditions, and that the claim was uncalled for so soon after the award to the tramwaymen. The men who were not tramwaymen, and who had received an advance of 2s. only three months ago, should be satisfied. The arbitrator heard the deputation from the men, and reserved his decision.

Maidstone.—Price Increase.—The T.C. has increased the charges for current for lighting by ½d. per unit, for traction by ½d. per unit, and the fixed charge per annum of 12s. per 30-watt lamp and all other forms of supply by 10 per cent.

Newport.—Linking-up.—Mr. A. Nichols Moore has reported to the Electricity Committee in regard to the linking-up proposals for South Wales, his report being generally in line with that already submitted to the Cardiff Electricity Committee by Mr. Arthur Ellis, and the Committee has authorised him to take any steps that are necessary to further the proposals, on the distinct understanding that such steps as are taken shall in no way commit it to any scheme. Mr. John Moxon, chairman of the Electricity Committee, emphasised the importance of the Corporation taking an active part in any deliberations that might be on foot.

Queensbury and Clayton (Yorkshire).—Prov. Order.—The Electrical Distribution of Yorkshire, Ltd., has informed the Queensbury Council that it has abandoned its application for a prov. order to supply Queensbury and Clayton, owing to the opposition of the Bradford and Halifax Corporations. The company considered it had an obligation to Queensbury, even if Clayton became merged in Bradford, and stated it would proceed with the application in the next session of Parliament.

Rochdale.—The Corporation Electricity Committee notifies that new applications for electric power supply cannot be entertained at present.

Royton.—An arrangement has been made between the District Council and the Oldham Corporation Electricity Committee for the supply of electricity. The contribution to the cost of the prov. order was fixed at £200 up to a cost of £300, and one half if over that sum. The prices are to be the same as those charged in the borough. To the withholding of consent to the Lancashire Electric Power Co. to come into the area, Royton agrees so far as it can lawfully do so. The period of agreement with Oldham is to be 30 years, terminable then on a prior six months' notice, with subsequent periods of 10 years.

Spenborough.—Proposed Bulk Supply.—The U.D.C. is in negotiation with the Yorkshire Electric Power Co. with respect to a bulk supply of electricity.

St. Austell.—Street Lighting.—The Electric Light Co. has asked the U.D.C. for an allowance of 30 per cent. on the contract price (£1 16s. 9d. per lamp per annum) in respect of 95 lamps unused last year. The Council has decided to offer 25 per cent.

Stoke-on-Trent.—The Ministry of Munitions is to be requested, before any men are taken from the existing staff of the electricity works, with the Dilution Officer's consent, to cause an inquiry to be held, as the obligations of the Corporation to give and maintain supply cannot be met with a smaller or less efficient staff than that which at present exists. Steps are to be taken to retain the commercial assistant, charge and shift engineers, switchboard attendants, stokers, and the pipefitter at the Burslem works, in view of the absolute necessity of maintaining the supply next winter. The B. of T. is to be asked to authorise the Council to disconnect part of the supply in the event of the staff being reduced below the minimum necessary to maintain the whole supply, lack of steam due to the want of sufficient and suitable coal, or any other cause rendering it necessary to reduce the load upon the steam generating plant at the central power house or any other of the stations.

Stratford-on-Avon.—Price Increase.—The E.L. Co. has, from the date of the August meter readings, increased the price of current by ½d. per unit.

Swindon.—Three-Phase Supply.—Last week the chairman of the Electricity Committee officially started up the new three-phase A.C. plant, which is now supplying a local works.

Tasmania.—The *Board of Trade Journal* mentions that the company which has been formed for the production of electrolytic zinc from the Broken Hill zinc ores is erecting large works at Risdon, which will shortly commence working. If successful, an extension of works, costing from £400,000 to £500,000, will be made as soon as possible.

Tonbridge.—Loan Sanction.—Without holding a public inquiry, the L.G.B. has given the U.D.C. sanction to a loan of £18,000 for extensions to the electricity works. Mr. M. P. Plunkett, electrical engineer, estimates that the extension will yield an annual income of £1,600.

Tunbridge Wells.—Price Increase.—The T.C. has increased the charges for current as from September 29th as follows:—Lighting, 10 per cent.; power and heating, 25 per cent.; power for lifts, 10 per cent.

Wimbledon.—Price Increase.—There was a deficit of £4,220 on the past year's working of the Corporation electricity undertaking, and it has been decided to raise a temporary loan not exceeding £5,000 to meet the working expenses. The charge for lighting in Wimbledon, Merton, the Maldens, and Coombe is to be increased to 6d. per unit, and for power, heating, and cooking to 2d. per unit.

TRAMWAY AND RAILWAY NOTES.

Accrington.—Year's Working.—During the past year over 6 million passengers were carried on the Corporation tramways, being 169,318 more than in the previous 12 months. The accounts show a deficit on the year's working of £976, notwithstanding the fact that the income was increased by £1,169. The sum of £872 has been granted to former employés now serving with the Colours. This is £155 less than in the previous year. A striking feature in the expenditure is the amount paid for power, £7,801, which is £1,915 in excess of the sum paid the year previous.

Australia.—A great strike of railway and tramway workers has taken place in New South Wales, it being estimated that 20,000 men are affected. The strike appears to have a political origin.

Belfast.—The recent revision of the stages and the fares of the Corporation tramway system, which it was hoped would have placed it on a better financial basis, had not that effect, for the reason that not a little of the increased revenue was immediately neutralised by raising the wages of the employés, plus quite a number of recent extensions which are not paying, and the making good of which is falling on the paying sections. Last year there was a deficit of £7,000, and there is now a certainty of a still greater deficit at the end of the present one. At the monthly meeting, the chairman of the Tramways Committee said that the time had come for the Corporation to call a halt in its expenditure, or it will have to ask Parliament to relieve it of the obligation imposed by Clause 63 of the Tramways Act of 1904. The undertaking has been saddled with an increased expenditure of £25,000 per annum, and as the revenue comes from the public, the latter must be prepared to pay up, or reconcile itself to the transfer of the undertaking to a private company. A partial remedy would be the lopping off of the terminal extensions, which are being run at a dead loss to the ratepayers.

Bradford.—In recording tramway receipts of £8,256 for last week, an increase of £577 on the receipts of the corresponding period last year, it is reported that the receipts for the 119 days of the current tramways year were £129,978, an increase of £11,322 on the same period of the previous year.

Burnley.—Following a mass meeting of Corporation tramway workers and the passing of various resolutions, it was reported on Monday that the men were about to come out on strike again. There was, however, an official assurance forthcoming from the men's secretary. It is alleged that learner drivers are being imported from Ireland.

Dartford.—Fire.—The car sheds and 13 cars employed in the local tramway service were destroyed by fire on Tuesday morning. Great inconvenience has been caused in the town, and L.C.C. cars are being sent as substitutes.

Glasgow.—War Relief Schemes.—The T.C. has given its consent to a new scheme for raising money through the agency of car collections in aid of the various war relief agencies. As has been reported in the Review, a large sum was secured by means of a prize drawing, the prizes consisting of works of art and war savings certificates. The Secretary for Scotland, however, prohibited the scheme, holding that it did not come under the scope of the Art Unions Act, a position from which he refused to recede, notwithstanding the representations made by several deputations who travelled to Westminster. The new scheme is, briefly, that tickets will be sold week by week as before at one penny each, but that no prizes be given—the holders of the numbers drawn in the lottery having the privilege of nominating the war charities to which the revenue accruing will be handed. Several members of the T.C. have maintained the opinion that the element of chance has not yet been eliminated from the scheme, while others argue that the sporting chance is not sufficient to attract the public, and that the scheme will, therefore, not be a success.

Halifax.—Track Renewals.—Replying to questions in regard to the Tramway Committee's proposal to relay portions of the track in Gibbet Street and on North Bridge, Mr. A. Broadley told the T.C., last week, that the Committee had sufficient rails to relay the most dangerous portion of the track—a stretch at Highroadwell, a little below the old tram depôt, and another length on North Bridge. No rails being now rolled, the Committee proposed to take up rails in Fountain Street, Church Street, Thrum Hall Lane, and in the upper car-shed, which were not being used, and use them for this relaying.

Keighley.—Owing to a misunderstanding, the recent arbitration award advancing the bonus from 5s. to 6s. a week, made no mention of the additional allowance of 6d. per week for each dependent child under 13 years of age, which had previously been in force, and as a result some married drivers found themselves worse off than before. This has now been rectified by the arbitrator.

Leeds.—Women Inspectors.—The Leeds Tramways Committee has appointed six women inspectors, who commenced duty on Friday, last week, despite the opposition of the department's employés. Mass meetings of male and female employés were held, and it was decided to inform the Tramways Committee that the women inspectors would not be recognised.

Nelson.—Electric Vehicle.—The Ministry of Munitions has refused to sanction the importation of an electric wagon purchased by the Health Committee from the Edison Accumulators, Ltd. The Committee has decided to ask the L.G.B. to assist it in obtaining permission for the delivery of the wagon.

Oldham.—Since the outbreak of war, 317 employés of the Corporation tramways have joined the Forces. The amount paid in allowances during the past 12 months was £5,463.

South Lancashire.—The Lancashire C.C. has decided to oppose the granting of the Lostock, and the Barton and Stretford Light Railway Orders, in view of proposed level crossings on main roads.

TELEGRAPH AND TELEPHONE NOTES.

New Wireless Record.—According to R. Thomberg and C. Bowers, operators on the American steamer *Sonoma*, wireless messages were picked up over the record distance of 11,500 miles by the *Sonoma* from the German station at Eilvese. The *Sonoma* was two days off Australia at the time.—*Wireless World.*

Trans-Atlantic Wireless Communication.—The Marconi Co. announces that, in conformity with instructions received from the Government, as from the 4th inst., its trans-Atlantic service, both East bound and West bound, has been discontinued until further notice. The closing of this service is in no sense brought about by any fault of the Marconi Co. either here or in Canada, but is purely a necessary war measure.

CONTRACTS OPEN AND CLOSED.

OPEN.

Australia.—Melbourne.—October 10th. Department of the Navy. Pumping plant and equipment for the Commonwealth Naval Dockyard, Cockatoo Island, Sydney. Specifications from the Director of Navy Contracts, Melbourne.

London.—Bermondsey.—Sept. 7th. B.C. 500-kw. rotary converter. See "Official Notices" August 3rd.

H.M. Office of Works.—August 20th. 400 miles of bell wire. See "Official Notices" to-day.

Manchester.—August 18th. Supply, &c., of two electrically-driven turbo-pumps with automatic control and switchgears, &c., for the Waterworks Committee. The Secretary, Water Department, Town Hall.

Portsmouth.—August 28th. Tramways Committee. Six months' supply of engine-room stores, insulating material, &c. See "Official Notices" to-day.

CLOSED.

Basingstoke.—T.C. Tar-oil for the electricity works: Burt, Boulton & Hayward, £5 5s. per ton.

Bridlington.—T.C. Coal (1,200 tons) for the electricity works: W. B. Wilson, York, 19s. 11d. per ton.

Rotherham.—T.C. Accepted tenders:—

Babcock & Wilcox, Ltd.—Six boilers and extensions to power station, £150,600.

British Thomson-Houston Co., Ltd.—Switchgear extension, £10,945.

Spenborough.—District Council. Supply of 1,000 tons each of coal for the electricity works for one year: W. Bennett and Sons, and W. H. Sharp & Sons.

Stoke-on-Trent.—T.C. Accepted tenders:—

British Westinghouse Co., Ltd.—3,000-kw. extension turbo-generator, &c. £18,895.

G. & J. Weir, Ltd.—10,000-gallon rotary feed pump, £321.

Aiton & Co., Ltd.—Pipes for cooling tower, £66 10s.

ANNEALING STEEL AND MELTING NON-FERROUS METALS IN THE ELECTRIC FURNACE.*

In a paper read before the Cleveland Engineering Society, Mr. T. F. Baily said that the development of electric furnaces for the heating operations subsequent to the melting and refining of steel had been attended by the usual slow progress of any radically new development; the types now in operation were the result of the gradual elimination of weak and faulty features rather than of skill in original design.

The incidental advantages of the modern electric furnace were so apparent that even at an equal operating cost for fuel, electricity now had the preference, while in some cases, where the net cost of operation with electricity was less than with gas or other fuel, complete installations of magnitude were being made.

All of the furnaces described were of the so-called resistance type, and had, in the case of rectangular furnaces, two troughs made of carborundum fire sand located one on each side of the furnace, with carbon or graphite electrodes located at each end of each trough. The troughs were filled with a broken carbonaceous material called "resister material" establishing a connection between the electrodes and completing the electric circuit. The general plan of these furnaces was similar to a closed box of fire brick in the walls of which were two glowers, which might be likened to huge incandescent lamp filaments. The control of the current, and hence the heat, was effected by varying the voltage impressed on the electrodes, this variation being obtained by means of numerous taps on the secondary of a special transformer supplied with each furnace.

A car-type 150-kw. annealing furnace, with the capacity of heating 1,000 lb. of steel to a temperature of 1,650 deg. F. in one hour, had a consumption of 300 kw.-hours per ton of material heated to that temperature. The door of the furnace was a heavy casting faced with fire brick, and backed by a filling of loose kieselguhr held in place by a steel plate.

A furnace of the same type, but of 300-kw. capacity, in the same plant as the previously described furnace, was used for annealing steel castings. Furnaces of this type were well adapted for handling steel castings and heating large or irregularly shaped forgings, or for the annealing of copper and aluminium, to which use they had already been put.

When materials were of uniform size, or of such shape and nature that they could be pushed along mechanically, or placed in containers of uniform size, the continuous furnace was sometimes preferable to the car-type annealing furnace. A 120-kw. furnace was used for carbonising rifle receivers in one of the large rifle-making plants in the East. The parts to be carbonised were placed in the usual pots and pushed through the furnace by means of pushers.

Other furnaces of the same general type, but with a different type of pusher, were used for annealing brass and German silver flatware blanks in one of the oldest and best-known plants making plated tableware. Two of these 200-kw. units in operation at this plant had an hourly capacity of one ton of brass each.

The heat treatment of steel, as distinguished from the simple annealing operation, consisted of heating the metal to above a critical point, quenching at that temperature in some cooling medium, such as water or oil, and subsequently reheating to a temperature under the critical point mentioned.

For the highest quality of work in heat treating, two furnaces were recommended, each one running at the ruling temperature desired in the material at that particular stage of its treatment, and a quenching bath (or spray, as the case might be) located between the discharge end of the first or heating furnace and the charging end of the second or drawing furnace.

Two sets of two furnaces each were already installed in a progressive manufacturing plant, for the heat treatment of cast-steel drawbar knuckles. Each set had a capacity of 72 tons of steel per day, and consumed 900 kw.

These particular furnaces, and a similar set of 600-kw. furnaces for heat-treating large high-explosive shells, were automatically controlled by special pyrometers, so that the only hand work required was the placing of material on the charging platform of the first furnace of the set.

The reliability of the type of furnaces described above for annealing and heat-treating work seemed to justify the assumption that with the necessary modifications as to hearth and shape of furnaces they would work equally well on non-ferrous metals. The first furnace for this purpose was installed three years ago for melting silver in one of the plants mentioned previously, where continuous annealing furnaces were used for annealing brass flatware blanks. This furnace was rectangular in shape, and provided with a hole in the top and the necessary cover. The metal was melted in crucibles, the furnace being adapted to hold two crucibles of size No. 40. Not only was silver melted, but scrap copper as well. The ruling temperature of the furnace was 2,500 deg. F., very hot metal being required, as the castings were small and the moulds heavy iron chills.

There seemed to be no real necessity for the use of a crucible excepting in the melting of precious metals. Their high cost, rapid destruction, and the necessity of handling small quantities of metal when they were used, with attending high labour charge, had led to the adoption of a tilting-hearth furnace. This type of furnace was first used for aluminium and aluminium alloys, and later the same type, with slight modifications in the details, had been used to melt brass.

This furnace, with a normal rating of 105 kw., and a melting capacity of 600 lb. per hour, had melted, and superheated to a suitable pouring temperature, the following materials, with an average energy consumption as noted below:—

New red brass.—400-lb. heats in 1 hr. with 90 kw.-hours, or 450 kw.-hours per ton.

Scrap yellow brass.—(72 per cent. Cu, 28 per cent. zinc) 750-lb. heats in 1 hr. 10 min. with 120 kw.-hours or 320 kw.-hours per ton.

Scrap yellow brass.—(70 per cent. Cu, 30 per cent. zinc) 800-lb. heats in 1 hr. 18 min. with 110 kw.-hours or 275 kw.-hours per ton.

Brass chips and borings.—(70 per cent. Cu, 30 per cent. zinc) 700-lb. heats in 2 hr. 30 min. with 220 kw.-hours or 720 kw.-hours per ton.

Of all the electric furnaces of the type described now developed, the tilting-type furnace was the one offering the greatest saving in cost over fuel-fired furnaces of any type, whether oil, gas, or coke fired, since the metal loss was lower, the crucible cost was eliminated entirely, while the labour item was less on account of size and convenience of operation.

The following figures might be safely taken as operating conditions with yellow brass in a shop operating 24 hours per day:—

	Per ton.
Electricity, 400 kw.-hours per ton at 1 c.	$4.00
Metal loss, 1 per cent. zinc at 10 c. per lb.	2.00
Labour, 1 man per hr. per 600 lb., at 40 c. per hr.	1.20
Renewals and repairs	1.00
Total per ton of melt	$8.20

It was believed that the performance of these brass-melting furnaces was such, and the saving over other methods so great, that their introduction would be rapid, even more so than in the case of the annealing and heat-treating furnaces described, which were now accepted without question.

* *Metallurgical and Chemical Engineering.*

NOTES.

The British Engineers' Association.—The fifth annual ordinary general meeting of this Association was held at Caxton Hall, Westminster, London, on July 26th, and was attended by a large number of representative members from many parts of the country. In moving the Council's report, balance-sheet, and income and expenditure account for the year ending December 31st, 1916, which had been issued to all members, the chairman (Mr. Wilfrid Stokes) reviewed the work done by the Association during the past year, and dealt with the action which it was proposed to take in future. The new memorandum and articles of association, which had been revised in accordance with the resolution passed at the extraordinary general meeting of the Association on July 13th, 1916, had received the sanction of the Courts, and were now operative. He reminded members that the memorandum and articles had been revised in order to strengthen the relations between manufacturing engineers and those bodies and individuals with whom they were naturally brought into contact in the course of their business, as set out in the Manchester scheme for the organisation of the British engineering industry. He pointed out that much interest had been shown in the election of the new Council, and for the 30 seats on the Council, about 90 members, including retiring members, were nominated in the various districts, a total of 1,369 votes being recorded.

At the first meeting of the Council, held the same day, Mr. Wilfrid Stokes was re-elected president, and the Council for 1917-18 stands as follows:—

President: Mr. Wilfrid Stokes.

Vice-Presidents: Mr. T. O. Callender, Sir John Cowan, Mr. Peter Denny, Mr. Herbert Marshall, Capt. L. E. Mather, Mr. J. E. Thornycroft, and Mr. Douglas Vickers.

Mr. Daniel Adamson	Joseph Adamson & Co.
Mr. H. Allcock	W. T. Glover & Co., Ltd.
Mr. H. Austin	Austin Motor Co., Ltd.
Mr. Stanley Brotherhood	Peter Brotherhood, Ltd.
Sir Edwin Grant Burls, C.S.I. ..	Vulcan Foundry, Ltd.
Mr. George Cradock	George Cradock & Co., Ltd.
Mr. Robert Goudie	London Bros., Ltd.
Mr. John Hemming	F. H. Lloyd & Co., Ltd.
Dr. G. B. Hunter	Swan, Hunter, and Wigham Richardson, Ltd.
Mr. John Hunter	Sir Wm. Arrol & Co., Ltd.
Mr. A. Jacob	British Aluminium Co., Ltd.
Mr. Christopher James	Joshua Buckton & Co., Ltd.
Mr. J. B. C. Kearns	H. W. Kearns & Co., Ltd.
Mr. B. Longbottom	Electromotors, Ltd.
Mr. Hugh Lupton	Hathorn, Davey & Co.
Mr. C. P. Martin	C. A. Parsons & Co., Ltd.
Mr. A. E. Owen	Rubery, Owen & Co.
Mr. Henry Steel	Steel, Peech & Tozer, Ltd.
Mr. T. Cuthbert Stewart	Stewart & Lloyds, Ltd.
Mr. H. J. Ward	J. & E. Hall, Ltd.
Mr. J. C. Ward	Edgar Allen & Co., Ltd.
Mr. A. P. Wood	Lancashire Dynamo & Motor Co., Ltd.

The Metric System.—According to *l'Industrie Electrique*, China will be the next convert to the metric system. Since February 15th the shops in Peking have adopted metric measures, authorised by the Chinese Chamber of Commerce under the instructions of the Ministry of Agriculture and Commerce.

A New U.S. Carbon Electrode Factory.—Work has been started on the first unit of a new factory that will form an immense addition to the present large plant of the Speer Carbon Co. at St. Mary's, Pennsylvania, and which, when entirely completed, will involve the expenditure of approximately £100,000 for additional land, buildings, machinery, equipment, and general improvements.

The first building, which will be devoted exclusively to the manufacture of the larger-sized carbon electrodes for electric furnaces will be 100 × 168 ft. (30·5 × 51·2 m.) in size, constructed entirely of brick, concrete, and steel. Glass sidewalls will also be employed, thus admitting daylight throughout the entire structure. It is expected that the entire plant will be in full operation by September next.

The Speer Carbon Co. has for several years past manufactured carbon electrodes in the smaller dimensions, the maximum sizes including 4 in. square and 6 in. diameter. The new factory will be equipped to turn out both round and square electrodes in all sizes from 6 to 24 in. in diameter.

The demand for carbon electrodes is daily increasing, the condition being caused by the enormous demand for tungsten steel and other products which, in turn, necessitated the installation of large numbers of electric furnaces throughout the entire country. The requirements of the Government have also influenced the Speer Carbon Co. very largely in the erection of a new plant.—*Metallurgical and Chemical Engineering.*

The Industrial Progress of Spain.*—For many years Spain has been depending upon England, France and Germany for goods of all kinds. These countries, and principally Germany, have dominated the Spanish market, due to their commercial organisations, to the establishment of branches of French, English and German banking institutions, to the facility with which the European manufacturers adapted themselves to trade conditions in Spain, to their sending out of Spanish-speaking salesmen, to the establishment of branch offices with goods on consignment and the granting of easy terms of payment. People in Spain have always been accustomed to having prices quoted, delivered in Spain, duty and freight paid. It has always been customary in dealing with substantial firms to grant from three to six months' credit against acceptance of drafts.

With the outbreak of the European War the country was suddenly cut off from its accustomed sources of supply, and a great paralysis of industrial life in Spain started on account of the disorganisation of the market. Slowly during the second year only of the war, Spanish industries began practically to realise to what extent they had been depending on foreign markets, and chiefly due to individual efforts, industrial life in Spain acquired in many branches a degree of activity never attained in previous peace times.

Spain is to-day a country in which electricity is developed to an astonishing extent. The cities of Madrid and Valencia are supplied with more than 40,000 H.P. produced by hydro-electric plants. In the district of Barcelona a company, largely managed by American interests, has just finished a concrete dam, 330 ft. high and 700 ft. long, the largest in the world, with an electric power plant producing to-day about 20,000 H.P. In the same district a French concern is building in the Pyrenees another hydro-electric plant, to bring 30,000 additional H.P. into the industrial district of Barcelona.

The principal industries in Spain, up to the present, have been the following :—Mining, textiles, lace, sugar, cement and gypsum, pottery, the steel industry of Toledo and Eibar, and shipbuilding. A prominent industry created in Spain in recent years is the railroad and tramway car-building industry. There are five factories in Spain, two of which are very important; Barcelona and Bilbao possess large blast furnaces and steel mills manufacturing rails, structural shapes, steel and tin plate.

An important automobile factory, turning out one of the best-known cars in Europe, exists in Barcelona, and a new truck factory is now under construction for the purpose of building 2,000 trucks and tractors per year.

In the Barcelona district alone the following new industries, with products for which the country always has been dependent on Germany, England and other countries, have been created: rolling mills for sheet-metal and structural shapes, tin plate, factories producing enamels and ironware, electrical supplies and motor factories, textile machinery, machine-tool woodworking and metal-working machinery. New plants have been erected, and several million francs have been invested in these new industries lately. In the last two years several new factories have been created with the exclusive object of specialising in the manufacture of machine tools, chiefly lathes, drilling machines and presses. In electrical material, lighting fixtures, large motors and generators, Spain has always been entirely dependent upon Germany and France for her supply. The Government intends to promote the installation of all kinds of industries supplying the country's needs in electrical material.

The industrial awakening of the country will, for the next 10 years, necessitate the establishment of factories that will require raw materials and machinery, tools and equipment.

* *American Machinist.* Extracts from an address delivered by H. S. Moos before the Foreign Trade Bureau of the Cincinnati Chamber of Commerce.

Low-Priced Lighting Fittings of Steel.—The *Electrical World* says that a brisk demand for low-priced lighting fittings has led a number of fittings manufacturers to place on the market a new line of fittings of the same design and appearance as expensive fittings, but produced to sell at a very low price. The secret of the low price is steel. In place of brass, which is used in the more expensive fittings, pressed steel with a brass finish is employed. This increased demand is coming from the labouring people, who during the last year and-a-half or more have been earning high wages. The demand for more expensive fittings has fallen off perceptibly, since the buyers of this class of goods are the salaried men. The labourer, however, has now more money than he ever had before, and consequently one of the trades to feel this increased buying power is the fittings trade.

Electrical Enterprise in Spain.—Under the style of Sociedad Espanola de Construcciones Electromecanicas, a company has been formed, with a capital of 25,000,000 pesetas, for the erection of works at Cordoba for the construction of all kinds of electrical machinery; 15 hectares (37 acres) of land have been acquired, and the aim of the promoters will be to render Spain independent of foreign importations. The capital is mainly Spanish, but French and English support is included, and apparently German, as the firm of Bauer is mentioned. The French promoters include the Creusot establishment, the firm of Fourcade, and the Union Parisien Bank.

Peat Fuel at Moscow Electricity Works.—The Assistant Minister of Trade and Industry, N. N. Savin, has proposed to the Provisional Government to grant a loan of 2,000,000 roubles to the Elektro-peredatch (Electrical Transmission) Co., Moscow, for a period of nine months, at 8 per cent. annual interest. The memorandum accompanying the proposition states that the company delivers 40,000,000 KW.-hours per annum, almost entirely for industrial purposes, the fuel for the production of which consists of the company's peat deposits. In the current campaign the company contemplates using 113,000 tons of air-dried peat, and the wages of the peat workers have risen about threefold. It is the increased wages list that necessitates the advance of cash asked for. The difficulties of the company were further accentuated by the Revolution having broken out just when the station was in course of construction, and the plans made earlier for financing the concern could not be carried out, owing also to the proposed elimination of foreign capital interests. The Minister adds that last year 70 per cent. of the work done by the company was for the national defence, and a considerable percentage of the energy delivered by the Moscow 1886 Company could, if the peat were properly exploited, be delivered by the Elektro-peredatch, and a corresponding consumption of petroleum be avoided. For the reasons stated, the Ministry considers that the loan requested should be granted.

Large Gas Engines in U.S.—The opinion seems prevalent, based probably on conditions a few years back, that the large gas engine is rapidly on the decline, and will soon be a thing of the past. Therefore, many will be surprised to learn that there are now in course of construction a large number of these units for at least four of the biggest steel plants in the country. Some of these engines will be of more than 4,000 H.P., and will be employed both for blowing and for driving electric generators. It appears then that the large gas engine business was merely lying dormant, awaiting the impetus to the steel industry which has been supplied by the conditions arising out of the war.—*Power.*

Volunteer Notes.—County of London Volunteer Engineers (Field Companies).—Headquarters, Balderton Street, Oxford Street, W.

Orders for the week, by Lieut.-Colonel C. B. Clay, V.D., commanding :—

Monday, August 13th.—Technical instruction (searchlight) for No. 3 Company, Right Half Company, at Regency Street. Drill, No. 3 Company, Left Half Company. Signalling Class. Recruits' Drill, 6.30.

Tuesday, August 14th.—Lecture, 6.30. Physical drill and bayonet fighting, 7.30.

Wednesday, August 15th.—Drill and elementary bridge construction, No. 1 Company, Right Half Company.

Thursday, August 16th.—Drill and elementary bridge construction No. 2 Company, Right Half Company. Ambulance Class.

Friday, August 17th.—Technical instruction (searchlight) for No. 3 Company, Left Half Company, at Regency Street. Drill, No. 3 Company, Right Half Company. Signalling Class. Recruits' Drill, 6.30.

Musketry.—All N.C.O.'s and men who have signed the "A" and "B" agreements are required to attend during this month to re-classify in order to enable the Corps to obtain the Capitation Grant. Preference will be given to these men in firing.

Armlets.—The new issue armlets can now be obtained at Headquarters, and every enrolled man must obtain one without delay, and all old (red) armlets must be returned to the Orderly Room.

Note.—Unless otherwise indicated, all drills will take place at Headquarters.

(By order) Macleod Yearsley, *Adjutant.*

Parliamentary.—The Electric Lighting Orders Confirmation Act, 1917, and the Companies (Particulars as to Directors) Act, 1917, have received the Royal Assent.

The Engineers' Award.—The Leyton Council raised a point as to whether the Committee on Production award applied to electrical workers, and has received the following letter from the secretary of the Committee on Production :—

"In reply to your letter of July 17th, the findings of the Committee on Production to which you refer affect directly only the establishments of members of the Engineering Employers' Federation, the arbitration proceedings in each case having been between the Engineering Employers' Association and the Trade Unions.

"The question of the application of those awards to a certified municipal electricity undertaking is not one upon which this Committee is able to advise. The Committee is an Arbitration Tribunal, and it can deal only with cases that are referred to it by the Ministry of Labour."

Electro-Culture.—As previously mentioned in these columns, Mr. E. M. Ashley, of Southport, is experimenting with electro-culture on an allotment at Crowlands, and expresses himself as confident in its success. He records good results with early crops, and mentions that the cost of electricity is about 1d. per day.

A similar experiment of a more ambitious nature is being undertaken by the Liverpool authorities at Calderstones Park, where an acre of ground has been initially equipped. The crops comprise a variety of vegetables and oats, and some 300 sq. yards of the ground is being treated on allotment lines, a similar control plot being provided for purposes of comparison. Although the experiment has only run a few weeks, the electrified crops have a healthier appearance than those in the control area.

In North Wales, an electro-culture equipment has been set up by Sir Thomas Roberts in his vegetable gardens at Plasybryn, Carnarvon. The equipment is run from a 220-volt circuit supplying the house, and the discharge wires are fixed at a height of 7 ft. above the ground. It is stated that the energy supplied to the primary terminals is 450—460 watts per acre, and also hinted that the owner contemplates experimenting with field crops later on.

National Insurance (Unemployment) Acts, 1911 to 1916. —Unemployment Insurance.—A. The Umpire has decided that contributions are payable in respect of :—

2,366 X. Students at technical institutes receiving training under arrangements made by the Ministry of Munitions.

B. The Umpire has decided that contributions are not payable in respect of :—

2,364 Workmen engaged wholly or mainly in wolfram streaming.

2,365. Workmen engaged wholly or mainly in printing, enamelling, varnishing, or similarly treating tin-plate prior to its being cut into sizes suitable for making boxes or canisters.

The Electrolytic Pickling of Steel.—Messrs. M. De K. Thompson and O. L. Mahlman, in a paper read before the American Electrochemical Society, state that all iron and steel objects which in the process of manufacture have been heated in the air are covered with "fire scale," which is an oxide of iron. This has to be removed before the surface can be plated or galvanised. The usual practice has been to immerse the objects in some acid until the scale is removed by the hydrogen formed by the action of the acid on the iron beneath the scale, which it reaches through the cracks in the scale. The action which would be expected if a sheet of iron covered with scale were used as a cathode in an acid solution is a reduction from a higher to a lower oxide. This oxide would be dissolved by the acid. There would also probably be a certain amount of chemical action between the iron under the scale and the acid, as in the purely chemical treatment. It is this action which the electrochemical process attempts to avoid as much as possible. The method of comparing the two operations consisted in treating two similar mild steel plates by the two methods until their appearance showed that the pickling was completed. In two experiments the saving effected, in acid and the amount of iron removed, for every 2,000 lb. of iron, including the cost of power, was about $70, and in a third about $50. These results point to important economies that may result from the adoption of the electrolytic method.—*Franklin Inst. Journal.*

A Log of Domestic Electricity Supply.—A recent article in the *Electrical World* contained some detailed figures as regards the daily use of domestic appliances by a family of two. A separate meter was installed for each of 10 different devices, another meter on two little used devices, and another for lighting. All cooking and heating of water was done electrically, but the water was heated, as required, by an immersion heater, which is said to act rapidly enough to make a fair substitute for a permanent hot water supply. It was impossible to segregate energy used for heating water, but the energy so used would be proportional to the number of times the disk stove and immersion heater were used for water heating, and this indicated a consumption for water heating of 375 KW.-hours, or 25 per cent. of total energy used for all purposes. The use of one outlet per device worked well, except for the immersion heater and the installation of a suitably worked double-throw switch, obviated the necessity of two outlets for this device.

The article contains tabulated data in regard to ratings and consumption for the year, month, &c., and number of times the device was used. Twelve lamps of 530 watts were in use, and 174 KW.-hours were consumed during the year. Percolator and samovar : used 81 times ; 9 KW.-hours used. Toaster stove : used 351 times ; 39 KW.-hours. Frying pan : used 586 times ; 122 KW.-hours. Immersion heater : used 910 times ; 272 KW.-hours. 9-in. disk stove : used 474 times ; 374 KW.-hours. Oven : used 238 times ; 429 KW.-hours. Fan : used 30 times ; 4 KW.-hours. Sewing-machine motor : used 61 times ; 2 KW.-hours. Iron : used 107 times ; 51 KW.-hours. Bathroom radiator : used 18 times ; 22 KW.-hours. The total connections made for using this apparatus (apart from lighting) were 2,856, which represents an average of 464 KW.-hour used for each connection. The total KW.-hours used for all purposes were 1,498.

The maker's rating in watts of the above apparatus was :—Percolator, 440 ; samovar, 440 ; toaster, 500 ; frying pan, 660, 330, or 165 ; immersion heater, 600 ; disk stove, 1,200, 600, or 300 ; oven, 2,000, 1,000, or 500 ; 12-in., three-speed fan (no loading given) ; sewing machine motor, ⅛ H.P. ; iron, 450 ; bathroom radiator, 1,500, 750, or 375 watts.

It will be noted, as one would expect, that the oven and disk stove used the bulk of the energy—*i.e.*, 429 and 374 KW.-hours respectively ; the immersion heater used only 272 KW.-hours. The bathroom radiator, though it only accounted for 22 KW.-hours during the year, took ·8 KW.-hour on the average each time it was used.

Attention is drawn to the value of the figure for average consumption of all appliances (·464 KW. hours) each time apparatus was used, and it is remarked that such devices as fans, sewing-machine motors, heating pads, &c., do little to increase the energy used, though they serve to popularise electric service.

Porcelain Pyrometer Tubes.—For the purpose of protecting thermo-couples at furnace temperatures the tubes made of Marquardt refractory porcelain by the Royal Berlin Porcelain Manufactory have proved very successful, as is shown by the experience of many years. These protection tubes, owing to war conditions, are now not obtainable.

The need of effective protection for the costly platinum and its alloys so extensively used in pyrometry prompted investigation and manufacture in the United States. The Ceramic Section of the National Bureau of Standards carried on experiments for the purpose of reproducing, and, if possible, of improving upon the Marquardt porcelain. The result was a highly refractory product which, though made entirely from American raw materials, was found to be of most excellent quality. The manufacture of this porcelain was taken up by the Stupakoff Laboratories of Pittsburgh, Pa., who successfully overcame the unavoidably attendent difficulties, and brought on the market a protection tube under the name "Usalite."

It is claimed by the manufacturers that tubes of this material will readily withstand exposure to temperatures exceeding 1,650° C. A highly refractory glaze covers the surface of the outer pyrometer tubes, in order to make them impervious to gases of combustion.

Usalite tubes, when withdrawn from white-hot furnaces, and brought into the open air, neither broke nor cracked. The smaller diameter unglazed tubes effectively withstood sudden exposure to highest temperature. A glazed outer tube heated to 1,100° C. readily withstood the introduction of cold steel rod of nearly the same diameter as that of the bore of the tube.—*Met. and Chem Engineering.*

Electric Loom Brake.—Mr. J. F. Crowley, Blackwater Mills, Rathmore, Co. Kerry, has been granted a patent (106,663) for an invention relating to electric and magnetic brakes. A solenoid is energised to take off the brake when the motor switch is closed, and the switch is held closed by a trigger device which can be released manually, or by a safety device on the (electrically-driven) loom, or by failure of the current. The solenoid may be short-circuited after the brakes have been taken off thereby, and the brakes may be held off by a second trigger, which may be connected to the switch-trigger device.

A Cardiff Electrical Dispute.—Mr. McWhirter presided at a special conference, held on Friday at Cardiff, concerning the strike of about 300 members of the Cardiff Electrical Trade Union. Members of this body met the representatives of the National Federated Electrical Association and Mr. Palgrave Simpson, head of the labour and wage section of the Ministry of Munitions. The whole matter of the dispute was carefully considered. The statement of the members of the Trade Union is that an award was made on June 8th placing the electricians on the same level as the allied engineering trades. The men came out owing to a different reading of the awards granted by the Committee on Production on this date, which gave the men 12s. per week more than pre-war rates. Consequently, notice was tendered to the employers that labour would be withdrawn if the awards were not observed. As the notice terminated on Thursday, about 300 men came out on strike. It has been stated that notice was also tendered to the Ministry of Munitions, but this is denied by the members of the National Federated Electrical Association. In the afternoon session the employers and Union representatives met, and the men agreed to resume work, the matter being referred to the Chief Industrial Commissioner (Sir George Askwith), with a view to arbitration as early as possible.—*Western Mail.*

Appointments Vacant.—Dynamo attendants (38s.) for the Manchester Corporation Electricity Works ; shift engineer, for the City of Peterborough Electricity Department. See our advertisement pages to-day.

London Association of Foremen Engineers.—A set of rules for conducting the business of meetings has been drafted and printed.

Electro-Chemically Produced Petrol.—In view of the scarcity and high price of petrol in this country at the present time, it is interesting to learn from New York that Mr. Louis Bond Cherry, who is described as a member of the American Institute of Electrical Engineers and of the American Electro-Chemical Society, is stated to have invented an electro-chemical process for producing synthetic petrol from kerosene or paraffin, at a cost of ¼d. per gallon. Mr. Cherry describes his process as the successful application of the electromagnetic theory of matter by mixing hydrocarbides ; it is also stated that an experimental plant capable of converting 60,000 gallons per day has been established, where 78 per cent. of the kerosene treated has been converted into petrol of a sufficiently high quality to run the engines of motor vehicles. It is added that further experimental work is in hand in connection with the proper length and diameter of the treating chambers.

Electric Steel.—In the issue of *La Nature* for July 14th, a description is given of the work being carried on at the Keller factory at Livet for the production of "synthetic pig-iron." As long ago as 1908, M. Keller took out a patent for a process of manufacturing synthetic pig-iron, consisting of the introduction of measured quantities of carbon and silicon into a molten bath of steel turnings. In order to improve the method, the Keller Co. was formed in 1915. The first work was the manufacture of steel-quality iron for shells. The works were extended, and this work was carried on more extensively. In the latest development M. Keller melts the turnings by the continuous process, in special electric furnaces, to obtain a steel with a carbon and silicon percentage higher than that finally required. The steel which is worked up is transferred to a refining furnace. With the new method the advantages are two. In the first place, the desulphurised and supercarburised steel, containing any required proportion of silicon, is obtained by continuous fusion, with maximum thermal efficiency, in the electric furnace. The work does not require the employment of specialists, and the energy consumption per ton does not exceed 600 KW.-hours. Secondly, the refining furnace gives a good yield per hour. The dephosphorisation process is carried out in a second operation. M. Keller has generously placed his invention at the disposal of the French Government, and a national factory has recently been erected somewhere in France to produce 300 tons per day.

Northampton Polytechnic Institute.—Particulars of the Engineering Day Classes and Courses in Technical Optics for the next session appear in our "Official Notices" to-day.

Australian Brown Coal Deposits.—The recent report of the Brown Coal Sectional Committee of the Institute of Victorian Industries, which has been investigating the utilisation of the Victorian brown coal deposits, much in the same way as the Canadian Advisory Council on Industrial Research, is doing in connection with the immense lignite deposits of the Dominion, contains some interesting features. The following is a synopsis of data contained in the report:—

Brown Coal Uses.—(1) To supply electrical power to Melbourne and other parts of the State; (2) briquette making for household and other requirements; (3) producer gas, town gas, tar and its derivatives, ammonia, and coke.

Power Production.—The Melbourne City Council and Melbourne Electric Supply Co. can at present supply a maximum of 28,000 H.P. Requirement in 1925, estimated from normal increase, 120,000 H.P. This estimate is for Melbourne alone, and does not allow for new industries made possible by cheap power. Electrolytic treatment of zinc concentrates may absorb 200,000 H.P.

Costs.—Newcastle slack coal costs 20s. per ton. Estimated cost of Morwell coal, 2s. 3d. per ton at mine. Morwell coal, with 40 per cent. moisture, has 0·416 the heat value of Newcastle coal. Electrical energy produced at Morwell by 5s. 5d. worth of brown coal equals amount produced in Melbourne from 20s. worth of Newcastle coal, and can be transmitted to town at about half the fuel cost of the latter. Victoria pays 10s. more per ton for black coal than New South Wales. The electrical power scheme will remove this handicap.

Briquetting.—Morwell briquettes need no binder, and can be produced at from 11s. to 13s. per ton. They can be sold to householders in Melbourne and suburbs at about 24s. per ton, as against 24s. 6d. for wood, 32s. 6d. for coke, and 35s. for black coal. Estimated cost of single-press plant, £15,000 to £20,000.

The report goes on to recommend that immediate State action be taken—(1) to confirm estimates in regard to public power requirements, and the best means of satisfying these by electrical energy generated from brown coal; (2) to decide what authority shall do the work, and when; (3) to obtain estimates of the cost of:—

(*a*) 50,000-KW. plant at Morwell, and of similar plant at Altona, with transmission line, &c., in each case.

(*b*) Opening up workings at Morwell, and equipping them to produce coal for a 50,000-KW. power station, and to supply 120 tons of briquettes a day.

(*c*) A briquetting plant, starting with a one-press unit of 60 tons a day capacity, with arrangements for ultimate expansion to six or seven presses.

(4) That two experts should be sent abroad immediately to investigate latest power plant practice, and equipment necessary to secure full utilisation of Victorian brown coal resources.

The State Cabinet has now decided to obtain the advice of a committee of experts, including Mr. H. R. Harper, city electrical engineer, Melbourne; Mr. W. J. Clements, manager Melbourne Electric Supply Co.; Mr. W. Stone, electrical engineer to the railways; and Mr. H. Herman, of the Geological Survey; on the best means of developing the deposits.

Fatalities.—An inquest was opened last Saturday regarding the death of Private Samuel Cowsill (23), 6th Manchester Regiment, who had been sent as an electrical engineer to work in connection with the installation at a new munition factory. On August 2nd, while engaged in wiring 20 ft. above the floor, he was using a blowpipe, which burst and burnt him severely about the face and chest. He fell in a heap on the floor, and was taken to the infirmary, where he died next day. The inquest was adjourned till August 10th, so that the Factory Inspector and witnesses could attend.

An inquest was held at Liverpool concerning the death of George Ferdinand Corfe (28), who was killed at Bibby's Copper Works, Garston, where he was working a pneumatic hammer. According to the *Liverpool Courier*, the air compressor was driven by electricity. The fuse-box was about 40 ft. from where he was working, and he was found dead in a crouching position on the floor with a fuse holder in his left hand. It was presumed he had gone to the box to replace a fuse, and had received a shock. This, it was stated, was no part of his duty, and the men were warned against interfering with the electrical installation. The jury returned a verdict that death was accidental and was due to electric shock, caused by deceased interfering with the fuse-box.

American Electric Brougham Test.—Our contemporary, the *Electrical Review and Western Electrician*, contains particulars of a speed and endurance test carried out with a Baker R and L stock vehicle, between Atlantic City and New York, under the auspices of the New York Electric Vehicle Association. The time taken was 5 hours and 58 minutes, showing an average running speed of 20·5 miles (33 km.) an hour, over the journey of 123·5 miles (199 km.). The entire distance was covered with the car running at fifth and sixth speeds. One of the startling disclosures brought out by this trip was that the energy used cost less than half the price of gasoline for the same work. Some 283 ampere-hours were used, or an average of 2·29 per mile (1·4 per km.), which at 5 cents (2½d.) per KW.-hour—the maximum charging rate in New York—would make the cost $1.55 (6s. 6d.).

Time Signals by Electric Lights.—A new kind of time signal has recently been installed at the Hector Observatory, Wellington, New Zealand. Three electric lamps are mounted in a vertical row on the Observatory flagstaff, 6 ft. apart; the lowest green, the middle red, and the highest white. The lights are switched on 50 minutes, 10 minutes and 5 minutes, respectively, before the hour of the signal, at which hour they are all extinguished simultaneously. The signals are given at 20 hours, 21 hours and 22 hours, Greenwich mean time.—*Scientific American.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—Blackpool Electricity Committee has considered an application from the Coal Mines Department of the Board of Trade for the services of Mr. CHARLES FURNESS, the borough electrical engineer, in rendering part-time assistance in visiting certain local authorities in Cumberland and North Lancashire with the object of discussing fuel economies and submitting reports thereon to the Board. The matter has been left to Mr. Furness to act as he may think best.

Burnley T.C. is increasing the salary of Mr. H. MOZLEY (general manager of the tramways department) from £450 to £500 per annum.

On Tuesday, the Exeter City Council unanimously adopted a resolution expressing entire confidence in Mr. MUNRO, electrical engineer, and warm appreciation of the ability he had displayed in the management of the undertaking. This decision was taken in justice to the engineer after the vote at a previous meeting, when, by 23 to 19, it was decided to reject the unanimous recommendation of the Electricity Committee to advance Mr. Munro's salary of £475 per annum. Ald. Reed (Chairman of the Committee) said that body had not met since the Council dealt with the matter, but the members were very angry at the way they had been flouted, and it was quite possible they might resign in a body by way of protest.

Sunderland T.C. on Wednesday agreed to the application of the Board of Trade (Coal Mines Department) for the partial use of the services of the general manager of the electricity department, temporarily, in connection with economy in coal consumption.

Mr. REGINALD XENAKY, lately of the Yorkshire Electric Power Co., has been appointed technical assistant to the station superintendent at the Salford Corporation electricity works. Mr. FRED VALENTINE, of Salford, has been appointed secretary to the borough electrical engineer.

General.—The Controller of Coal Mines has appointed Mr. FRANK PICK, commercial manager of the London Electric Railways, as his assistant to deal with matters in connection with the London coal distribution scheme.

At the head office of Messrs. Ellis & Ward, Ltd., Portugal Street, Kingsway, on July 31st, Mr. C. W. V. CLARKE, London manager, and Mr. H. FOWKES, of the engineering staff, the former having completed 21 years and the latter 22 years of continuous service with the company, were presented with gold half-hunter watches with engraved inscriptions. Mr. H. Willoughby Ellis, managing director, made the presentation.

Mr. A. W. ASHTON, D.Sc., M.I.E.E., has been appointed Principal of the Mechanical and Electrical Engineering De-

partment of the Stoke-on-Trent Central School of Science and Technology.

Lieutenant J. S. B. Plummer, who has just returned to France, joined the Surrey Yeomanry (Queen Mary's Regiment) at the outbreak of war, and later transferred to the Leicestershire Regiment, from which he was recommended for a commission. Lieutenant Plummer was formerly a representative of W. T. Henley's Telegraph Works Co., Ltd., in the Midlands.

Sapper Harry Jones, of the 3rd Electrical Section, R.E., who before the war was partner in the firm of Frederick Thomas & Co., asks us to state that he is not the Sapper Harry Jones whose death has occurred at Longmoor. He is well, and usefully employed in France.

Roll of Honour.—Private A. Coyle, of the Manchester Regiment, killed in action, was with Messrs. Brankingham Bros., electrical engineers, Sunderland.

Lieutenant J. N. Payne, who joined the South African Infantry as a private, and who has died of wounds received in action in East Africa, was formerly on the staff of Messrs. Bruce Peebles, Ltd., of Edinburgh, and just prior to the war he accepted a position at a power station at Johannesburg, South Africa.

Armourer's Mate A. J. Wallace, who was lost by the explosion on H.M.S. *Vanguard*, joined the Navy whilst with Mr. W. D. Willson, electrician, of Croydon.

Gunner A. Holt, aged 22, of the R.F.A., who has been killed in action, was employed at the United Electric Car Works, Preston.

Private B. Metcalfe, K.O.Y.L.I., who has died in a French hospital, was formerly an electrical engineer in the employ of the Belfast City Tramways Co.

Private E. Frame, of the King's Liverpool Regiment, killed in action, was employed by Messrs. Ward & Goldstone, Salford.

Second-Lieutenant O. V. Moseley, Lancashire Fusiliers, attached King's Liverpool Regiment, wounded and gassed, is the well-known North of England and Lancashire County lacrosse player. Before the war he was a representative of Messrs. C. Macintosh & Co., Ltd., electric wire and cable manufacturers.

Private B. C. Stockwell, Manchester Regiment, who has died from wounds received in action, was employed by Messrs. Dorman & Smith, Ltd., of Salford.

Gunner W. L. Wolstenholme, R.F.A., reported wounded in action, was employed by Messrs. Jones Bros., electricians, Blackpool.

Sergeant S. Ward, South Staffs. Regiment, who enlisted from the Rugby works of the B.T.H. Co., has been awarded the Military Medal for gallantry.

Private W. H. Dyce, City of London Rifles, killed in action, was on the staff of the Ilford U.D.C. electricity works.

Private J. Fletcher, North Staffs. Regiment, who has fallen in action, enlisted whilst with Messrs. Siemens Bros., Ltd., of Stafford.

Private R. Holmes, Northumberland Fusiliers, who has fallen in action, was on the staff at the York Corporation electricity works.

Private J. Enticott, Oxford and Bucks Light Infantry, employed at the Rugby works of the B.T.H. Co., has gained the Military Medal for gallantry whilst acting as a stretcher bearer.

Private T. Cunningham, Lancashire Fusiliers, killed in action, was on the staff of the Manx Electric Railway Co., Douglas.

Company-Sergeant-Major Fenton, of the Lancashire Fusiliers, a tramcar driver in the service of the South Lancashire Tramways Co., has been appointed to a commission as second lieutenant in the 3rd King's Liverpool Regiment. He joined up on the outbreak of the war, having been discharged on pension after a period of 21 years 150 days with the Colours. He saw service in the Dardanelles campaign, was subsequently transferred to Kantara, Egypt, and then to France.

Private L. Smith, Scots Guards, who was employed at the Electrical & General Stores, Leeds, has been killed in action, aged 20.

Captain L. A. F. Foers, who was articled as an electrical engineer to Mr. Priestley, the manager of the Mexborough and Swinton Tramways, has been wounded in action. Some time ago he was awarded the Military Cross.

We regret to learn that Captain James Grimshaw Cunliffe, M.Sc. (Tech.), A.M.I.C.E., A.M.I.E.E., of the Manchester Regiment, died of wounds on August 1st. Three weeks ago he was awarded the Military Cross for bravery. Captain Cunliffe was educated at Accrington Technical School and the Manchester School of Technology. After taking his degrees he entered the service of the Manchester Corporation tramways, attaining the position of assistant electrical engineer. He went from Manchester to a similar position at Birmingham, remaining there until the war broke out. Joining the Victoria (Manchester) University Officers' Training Corps in August, 1914, he received his commission in one of the Manchester Regiments ("Pals") on their formation. Besides being an active member of the Manchester Section of the Institution of Electrical Engineers, Captain Cunliffe was joint author with his brother, Mr. R. G. Cunliffe, M.Sc. (Tech.), in the publication of papers read before electrical associations.

NEW COMPANIES REGISTERED.

Etablissements de Dion Bouton Société Anonyme (1,596F).—Particulars filed July 28th, 1917. Registered in France, January 25th, 1908, to exploit and develop the factories and undertakings founded by De Dion Bouton & Co., and carry on the business of manufacturers of and dealers in motors, mechanical implements, motor chassis, &c., and also to carry out transactions in metallurgy and various branches of the electrical industry. British address: 10, Great Marlborough Street, W. Messrs. Kenneth Brown, Baker & Baker, of Lennox House, Norfolk Street, W.C. 2, are authorised to accept service.

Piggott Electrical Co., Ltd. (148,132).—Private company. Registered August 1st. Capital, £5,000 in £1 shares. To take over the business of the Piggott Electrical Co., the Piggott Conduits & Cable Co., and the Piggott Electrical Lift Co., carried on by George and Sarah Piggott at 24, New Bridge Street, E.C. The subscribers (each with one share) are: Geo. E. Piggott, 24, New Bridge Street, E.C. 4, electrical engineer; Sarah Piggott, Loxwood, Woodcote Avenue, Wallington, Surrey. Permanent governing director, Geo. E. Piggott. Registered office: 24, New Bridge Street, E.C.

Brodmins, Ltd. (148,137).—Private company. Registered August 2nd. Capital, £2,000 in £1 shares. Electro platers, electro depositors of metal or other substances, enamellers and finishers of china, porcelain, earthenware, pottery, and glass, gold and silver refiners, gold and silversmiths, jewellers, manufacturers and dealers in novelties and fancy goods, metal toy manufacturers, &c. The subscribers (each with one share) are: F. H. Pepper, 34, Waterloo Street, Birmingham, solicitor; J. E. Smith, 78, Springfield Road, King's Heath, Birmingham, cashier. First directors are to be appointed by the subscribers. Registered office: 34, Waterloo Street, Birmingham.

S. T. Taylor & Sons, Ltd. (148,146).—Private company. Registered August 2nd. Capital, £15,000 in £1 shares. To acquire the business carried on at Scotswood-on-Tyne as S. T. Taylor & Sons, and to carry on the business of manufacturers of and dealers in non-conducting cements and other coverings suitable for boilers, pipes, heated and other surfaces, and the insulation of ships, refrigerators, and buildings of all descriptions, builders' contractors, mechanical, electrical, aircraft, heating, and sanitary engineers, manufacturers of and dealers in chemicals, oils, colours, cements, and varnish, motor-car manufacturers, &c. The subscribers (each with one share) are: E. Taylor, Roseworth, Whickham, Co. Durham, cement manufacturer; S. T. Taylor, Holmcroft, Grange Road, Newcastle-on-Tyne, cement manufacturer. The first directors are E. Taylor and S. T. Taylor, each of whom may retain office while holding 1,000 shares. Registered office: Tynos Works, Scotswood-on-Tyne.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Lamplough & Son, Ltd.—Satisfaction in full on July 10th, 1917, of mortgage dated May 16th, 1916, securing £1,200, has been filed.

Mander & Co., Ltd.—First mortgage debenture dated July 20th, 1917, to secure £400 and interest charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Minnie Gertrude Mander, 38, Davey Road, Perry Barr, Birmingham.

CITY NOTES.

Crompton and Co., Ltd.

At the annual meeting, last week, the chairman said that he was sorry that they were not able to present at that meeting the accounts for the year ending March 31st, 1917, but, in deciding to postpone their publication, they were following the example of many other companies which, like themselves, were controlled establishments. He was able to say, however, that the turnover showed a very satisfactory increase on that of the previous year. Unexecuted orders at the works at the close of the year represented a very large amount—greater, in fact, than the total annual output a couple of years ago. The company's profit-earning capacity likewise continued to expand. With their increasing turnover, and with the continued rise in price of material, they still found it necessary to be conservative in the matter of distribution of profits, quite apart from the fact that they had the important question of war taxes to bear in mind. They felt, nevertheless, quite justified in recommending a distribution of 5 per cent. on the ordinary shares, in addition to the preference dividend. There was much talk of Labour unrest, but the relations between their company and its employés during the year had been entirely satisfactory. They had added considerably to the number of women employed—they were doing excellent work. Many of the staff at the works had had to put in long hours, but they had done it with a willingness which was much appreciated. If ever the employés had merited their thanks it was in respect of the work done in the past year. To Mr. Reeves, the managing director and secretary, and to Mr Britten, the works manager, and now a director, were due their hearty thanks. To these two gentlemen, loyally supported by their efficient staff, was to be attributed the general improvement in the company's position. They had sustained a loss in the death of Mr. E. J. Erskine, their Aus-

tralian manager, who had been the head of the Sydney office for over 20 years. With regard to the future, they had plenty of work in hand, and this should mean satisfactory profits for the current year. They would publish the accounts for last year as soon as possible. No pains were being spared to arrive at final figures which they could place before them. In regard to the question of war taxation, this country was, in effect, a gigantic trading concern, and one result of the war was to dissipate a very large amount of the working capital of that trading concern. When the working capital of a business was reduced, that business was no longer able, with its smaller working capital, to do the volume of business that it previously carried on without embarrassment. It followed, in his opinion, that when the war was over very great efforts would be required of the commercial community to restore and augment the trade of the country. The Government, in their policy of war taxation, were paying too little attention to this all-important matter of the future rehabilitation of the country's trade, and he sincerely hoped that the many efforts which had been made by commercial men to impress upon the Government the importance of this point would not be without some effect.

French Companies.

The accounts of the *Société Westinghouse* for 1916 show net profits of £76,000, as compared with £42,000 in the previous year, and with the amount brought forward the balance available is £101,000, as against £58,000 in 1915.

La Société des Cables Berthoud-Borel reports net profits amounting to £18,200 for 1916, as contrasted with £7,900 in the preceding year, the balance forward raising the sum available for distribution to £26,000. It is proposed to pay a dividend of £1 12s. per share, and to carry £13,000 forward.

The Société des Tramways de l'Est Parisien reports that the continuation of the war placed a heavy burden on the results in 1916. Although the traffic showed an improvement over the preceding year, the company was confronted with a considerable increase in the working expenses, owing to the advancing cost of labour and materials, and the profits consequently underwent a marked decline as compared with 1915. The directors had applied to the Prefect of the Seine for compensation in the form of a request to increase fares, but had not obtained any satisfaction. The profits amounted to £32,000, as compared with £48,000 in 1915, and after meeting compulsory charges, taxes, &c., the balance of £17,000 has been transferred to the renewal fund.

The report of the *Ateliers de Constructions Electriques du Nord et de l'Est, of Jeumont-Nord*, reminds the shareholders that as the company's works were situated in enemy occupied districts it was impossible to submit accounts for 1916, as in the previous year. Every effort had been made by the directors to keep themselves informed of the state of their works and installations during the occupation, but communication had become more difficult and uncertain in recent months, and the information obtained from various sources was frequently mostly of limited accuracy. However, there was reason for believing that most of the plant and supplies at the works had been carried off by the enemy, although the company would only know definitely the exact situation when the district had been evacuated. The equipment of the workshops at Saint-Ouen had been increased, and the results hitherto had been satisfactory. The directors were chiefly preoccupied with maintaining their plant which could subsequently be transferred to Jeumont, in order that the latter works might be put in a condition to resume working as soon as possible.

The Société Parisienne pour l'Industrie des Chemins de Fer et des Tramways Electriques, which is a promoting and investment company with an ordinary share capital of £2,000,000, reports that the financial results in 1916 were again affected by the consequences of the war, and the situation was substantially the same as in the previous year. A large number of the industrial establishments and tramways established or developed by the company were still occupied by the enemy, and information could only be given concerning the others, which experienced more and more the influence of the excessive rises in the prices of coal and other raw materials. Among these undertakings are mentioned the Société d'Electricité de Paris, the Tramways de Paris, the Chemin de Fer Métropolitan, the Société d'Electricité pour la Russie, the Chemins de Fer Economiques du Nord, and the Cairo Electric Railway and Heliopolis Oases Co. The accounts for 1916 close with a credit balance of £106,000, of which the balance forward represents £87,000. After meeting general expenses the balance of £98,000 has been carried forward to the next account.

The directors of *l'Eclairage Electrique* state that new manufactures were undertaken in 1915-16 at the instance of the Munitions Department, and the company's works, especially at Lyons, had been largely extended. The number of workers exceeded 18,000, of whom 44 per cent., or over 8,000, were women. Extensions were also made at the works in the Rue Lecourbe, where the construction of electrical machinery had been resumed with great activity, whilst at the same time continuing the production of equipment for the various munition works. The Lorraine workshops at Jarville, although partly occupied by the military authorities for the repair of motor lorries, had nevertheless resumed the construction of electric motors. A foundry added to these shops had rendered useful services to the company's other works for the manufacture of machine parts, engine parts, and lathes; a steel plant had also been started, and orders were being executed for dynamo steel and steel for machine guns; and an electric furnace was in process of erection for the production of tool and special steels. Land had been purchased for the extension of the works in the Rue Bolivar in order to increase the output of cables and wire; the production of war material at the Colombes works had been augmented, whilst more active demands were experienced every day for tubes and small appliances, and it had been also necessary to embark on the manufacture of electrical apparatus which were hitherto only made abroad, in order to meet the requirements of customers. The works in the Avenue de Choisy had also been enlarged. The net profits are returned at £150,000, and after transferring £90,000 to the general reserve fund the balance has permitted of the payment of a dividend of 10 per cent. for 1915-16.

The Swiss Brown-Boveri Co.—The report of Brown, Boveri & Co., of Baden, states that the pressure of orders continued throughout the financial year 1916-17, notwithstanding the advance in sale prices. On the other hand, the greatest difficulties were experienced in obtaining supplies of raw materials, especially in the second half of the year, when deliveries from Germany considerably decreased. As a consequence, it was impossible to reach the former level of production in peace times from the standpoint of quality, but the turnover financially and the results corresponded to normal years. The activity of the company, it is said, was again restricted solely to the branches worked in peace times. All the foreign manufacturing undertakings associated with the company had yielded satisfactory results. In the case of the electricity supply works a great demand for energy prevailed, and the sales showed a considerable increase. The cost of production in the case of the hydro-electric works remained within the customary limits, but the steam generating stations suffered from the extraordinary rise in the cost of fuel, which could scarcely be equalised by an advance in the charges for current, as these were mostly fixed by contracts of long duration. The conditions created by the war had brought forward in Switzerland the importance of the greater utilisation of water power and of electric railway working. It was recognised specially in regard to the latter that military considerations were not against electrification if it was compared with the danger of the complete dearth of coal in the case of steam railways. Unfortunately, a great obstacle to rapid progress was found in the difficulties in carrying out new installations and the provision of the machinery. In the matter of the conversion of the St. Gothard railway to electric traction, the report mentions that the Ritom power station was in course of construction and trial locomotives were on order; but it could not be foreseen when the latter would be completed. The accounts for 1916-17 indicate gross profits of £332,000, as contrasted with £454,000 in the preceding year. After defraying general expenses, and setting aside £106,000 for depreciation, as against £53,000 in 1915-16, the accounts show net profits and balance forward of £122,000, as compared with £106,000. It is proposed to pay a dividend of 7 per cent. on the ordinary share capital of £1,280,000, this contrasting with 6 per cent., 5 per cent., and 5 per cent. in the three previous years respectively. The share capital is now to be increased to £1,440,000 by the issue of new shares for £160,000.

Spain.—*The Compagnie Generale Madrilene d'Electricité*:—The French committee of holders of bonds in this Madrid company, whose financial troubles were referred to in this journal on February 16th in the present year, announce that the French Government have offered to purchase these bonds at the price of 440 frs. net per bond. Those holders who accept the offer, which the committee consider to be advantageous to the owners, are requested to deliver the bonds to the Société Générale or to the Banque Périer as soon as possible. The intervention of the Government is due to the circumstance that the purchase and re-sale of the bonds will have a favourable influence on the rate of exchange by procuring capital for French national needs in the Spanish market, and the committee recommend the holders to co-operate with the Government in the matter, they, at the same time, mentioning that it has only been possible to offer the price of 440 frs. per bond by reason of the rise in the peseta in relation to the franc, which increase appears momentary, and will disappear.

Consolidated Electrical Co., Ltd.—The accounts for the year ended March 31st show an available sum, after providing for general charges and including £3,159 brought forward, of £6,716. A dividend of 2½ per cent. has been declared, the same as for 1915-16, leaving £3,066 to be carried forward.—*Financial Times.*

Waste Heat & Gas Electrical Generating Stations, Ltd.—Interim dividend of 2½ per cent. for the half-year ended July 31st, less tax.

Willans & Robinson, Ltd.—The "Financial Times" reports that holders of "B" preference stock of Willans and Robinson have received an offer from Dick, Kerr & Co. of 50 6 per cent. cumulative preference shares and 20 ordinary shares in that company, or, alternatively, £65 in cash in exchange for each £100 of "B" preference stock held. The offer will remain open until 30th proximo.

Kensington & Knightsbridge Electric Lighting Co., Ltd.—Interim dividend, 3 per cent. on the ordinary shares for the June half-year.

Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers during the five weeks ended June 1st, 1917, amounted to 2,700,256, compared with 2,482,756 units in 1916.

Montreal Tramways Co., Ltd.—Further dividend of 2½ per cent., making 10 per cent. for the year.

Vickers, Ltd.—Interim dividends for the June half-year: 2½ per cent. (less income-tax) on the preferred 5 per cent. stock and 5 per cent. preference shares; 1s. per share (free of income-tax) on the ordinary shares.

STOCKS AND SHARES.

Tuesday Evening.

Holiday influences are the main factor in Stock Exchange markets. Evidently a good many people extended the Bank Holiday for a day or more longer; at all events, the attendance in the Stock Exchange is certainly less than it has been of late. The possibility of another new loan, so far from having any adverse effect upon investments stocks, seems to be somewhat inspiring, because the gilt-edged markets are so firm as to reflect strength into other investment departments, and once again the scarcity of floating stock is prominently noticeable.

Marconi shares underwent a sharp reaction when it became known that the Government had commandeered the overseas service of the company. This announcement, with its abrupt 24 hours' notice, coming on the top of a report which was considered disappointing, caused a good deal of selling of the shares, the price of which has fallen 3/16 to 2 15/16. The preference are also ¼ down at 2½, and all the recent buoyancy has been wiped out. On the fall, however, cautious bargain-hunters appeared, and moderate purchases were made by those who contend that the Government payment for services since August, 1914, is bound to be a substantial one. The yield on the shares comes to over 5 per cent., and the dividend is still included in the price.

The cable group is as strong as ever. Globe ordinary shares at 12¼ are ¼ up. Eastern ordinary, Eastern Extensions and Westerns held their recent rises, and it is pointed out that on the quartet just mentioned an average return of 5½ per cent. is obtainable, which is equal to 7½ per cent. on taxed dividends.

Naturally, it does not stand to reason that because companies have paid their dividends tax free in the past, they will continue this practice indefinitely; and the example of several big industrial concerns is quoted as a warning to undue optimism in respect of these cable and manufacturing companies' shares. As we have pointed out in the past, however, there can be little doubt but that they will do their utmost to maintain a long tradition; and as the trend of investment at the moment is set strongly towards the shares of companies which do distribute their dividends tax free, there is not likely to be any diminution in the strength of the stocks of the companies concerned.

India-rubber shares are another 5s. up, but still the yield of 7½ per cent. is certainly tempting, being equivalent to 10 per cent., less tax. The Telegraph Construction return of 6¼ per cent. is equal to over 8 per cent., less tax. The same trend has assisted a further recovery in the income bonds of the Underground Electric Railways of London. Whereas the price fell 5 to 79 on the declaration of the dividend, it has now rallied to 81½, this including the 2 per cent. net due in three weeks' time, and so affording a clean return of 5 per cent. on the money.

Metropolitan Railway ordinary hardened to 22½, in sympathy with improvement in Home Railway stocks as a whole—due mainly to the pronounced firmness of gilt-edged issues. Districts remain at 15½.

Interim dividends by the Home Electricity companies are sufficiently satisfactory to have brought fresh buyers into the market. Charing Cross ordinary at 3¼ show a rise of 5s. St. James' are ¼ up at 6¼. It is a little curious to notice that both the ordinary and preference of the Charing Cross Co. yield the same amount. Business is quiet in this department, where buyers, however, are more conspicuous than sellers.

The foreign groups are colourless, and news from Mexico is anxiously awaited. Brazilian Tractions stick at 50. The Argentine Tramways market is a shade firmer, without, however, affecting nominal quotations. No recovery has yet started in British Columbia Electric Railway issues.

General Electric ordinary have improved to 16, and the preference maintain their rise to 10¼. Miscellaneous shares are firm throughout. In the Rubber market, the price of the raw material improved to half-a-crown per lb. without inducing any appreciable increase in business. There is nothing of fresh interest in the markets for base metal descriptions, and the armament group is good, without showing much change.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price Aug. 7, 1917.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	9	6¾	—	£6 18 6
Charing Cross Ordinary	5	5	8¾	+ ¼	6 13 4
do. do. do. 4½ Pref.	4½	4½	8¾	—	6 13 4
Chelsea	4	3	2¾	—	5 4 4
City of London	5	8	12¾	—	6 5 6
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	11¼	—	6 4 6
do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	10	5½	—	5 11 7
London Electric	2	2	1	—	Nil
do. do. 6 per cent. Pref.	6	4	8¾	—	5 6 8
Metropolitan	3	3	2¼	—	6 0 0
do. 4½ per cent. Pref.	4½	4½	3¼	—	7 4 9
St. James' and Pall Mall	3	3	6¼	+ ¼	5 18 6
South London	5	5	2¼	—	7 5 6
South Metropolitan Pref.	7	7	21/6	—	6 10 3
Westminster Ordinary	7	7	6¾	—	5 1 9
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	97½	—	6 2 0
do. Def.	30/6	1½	22½	—	6 16 4
Chile Telephone	5	5	7	—	6 14 4
Cuba Sub. Ord.	5	5	8¾	—	5 17 8
Eastern Extension	6	6	14¼	—	*5 11 4
Eastern Tel. Ord.	6	6	143¾	—	*5 11 6
Globe Tel. and T. Ord.	7	7	12¼	+ ¼	*5 9 10
do. Pref.	6	6	10¾	—	5 15 8
Great Northern Tel.	22	24	36	—	6 13 4
Indo-European	15	12	83¾	—	6 3 10
Marconi	10	15	2⅞	— /6	5 2 0
Oriental Telephone Ord.	10	10	3¾	—	3 16 5
United R. Plate Tel.	8	8	6¾	—	*6 0 9
West India and Pan.	6d.	6d.	1⅛	—	1 12 0
Western Telegraph	8	8	14¾	—	*8 10 4
Home Rails.					
Central London, Ord. Assented	4	4	61½	—	6 10 1
Metropolitan	7	1	22¾	+ ¼	4 5 6
do. District	Nil	Nil	15½	—	Nil
Underground Electric Ordinary	Nil	Nil	1¾	—	Nil
do. do. "A"	Nil	Nil	1½	—	Nil
do. do. Income	3	4	81½	+ ½	*4 18 2
Foreign Trams, &c.					
	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	6½	6½	9¾	—	9 11 4
do. 2nd Pref.	4½	—	2¾	—	—
do. 5 Deb.	5	5	82	—	7 6 6
Brazil Tractions	4	4	50	—	—
Bombay Electric Pref.	6	6	10	—	6 0 0
British Columbia Elec. Rly. Pfce.	5	5	50½	—	9 19 0
do. do. Preferred	Nil	Nil	30½	—	Nil
do. do. Deferred	Nil	Nil	27½	—	Nil
do. do. Deb.	4½	4½	55	—	7 14 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	26	—	Nil
do. 6 per cent. Bonds	Nil	Nil	30	—	Nil
Mexican Light Common	Nil	Nil	14¾	—	Nil
do. Pref.	Nil	Nil	32¾	—	Nil
do. 1st Bonds	Nil	Nil	89¾	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	3¼	—	4 17 10
British Aluminium Ord.	7	10	80⅞	—	6 13 4
British Insulated Ord.	17½	20	135	—	7 15 0
British Westinghouse Pref.	7½	7½	2⅝	—	5 17 2
Callenders	20	20	141	—	7 0 6
do. 5 Pref.	5	5	4¼	—	6 1 8
Castner-Kellner	22	22	31	—	7 16 8
Edison Swan, fully paid	—	—	11	+ ⅛	6 19 2
do. do. 4 per cent. Deb.	4	4	70¾	—	Nil
Electric Construction	7½	7½	7⅜	—	5 13 6
Gen. Elec. Pref.	6	6	10¾	—	8 0 0
do. Ord.	10	10	16	—	5 17 1
Henley	25	25	18	+ ½	6 5 0
do. 4½ Pref.	4½	4½	4	—	7 16 8
India-Rubber	10	10	18½	+ ½	5 12 6
Telegraph Con.	20	20	30½	—	*7 14 0
					*6 5 2

* Dividends paid free of income-tax.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	Inc.
		£	£		£	£		
Bristol (Trams)	July 27	32,982	+2,926	30	155,146	+19,479	30·5	..
Cork	" 27	2,684	+ 303	30	15,742	+ 907	9·89	..
Dublin	" 27	50,605	+2,850	30	194,584	+22,119	54·25	..
Hastings	" 29	5,962	+1,067	30	32,883	+ 5,641	19·8	..
Lancashire United	" 25	11,778	+3,907	30	64,897	+13,879	43	..
Llandudno-Col. Bay	" 30	1,869	— 82	33¼	8,678	— 680	6·5	..
Anglo-Argentine	" 20	198,402	+3,930	30	1,535,461	+ 7,070	..	..
Auckland	June 30	23,563	+1,888	52	283,694	+ 7,981	26·59	..
Caloutta	July 31	18,432	+ 80	..	..	+ 1,845	..	..
Kalgoorlie, W.A.	April	2,705	..	17	10,101	..	20·5	..
Madras	June 30	4,309	+ 840	26	27,227	+ 2,538	..	..
Montevideo	July	28,597	+3,977	30	271,880	+ 5,105	..	..
Dublin-Lucan Rly.	June 15	806	+ 142	24	3,404	+ 226	7	..

TRADE IN SOUTH AFRICA.

A summary is given below of certain sections of the recently-issued report* of H.M. Trade Commissioner in South Africa, which will be of interest to the electrical and allied trades:—

It is hardly an exaggeration to say there is no engineering industry in South Africa. The operations of the iron foundries, such as exist, are almost entirely confined to repairs and replacements, mainly in connection with the gold mines; and engineering establishments similarly deal with repairs and erection of imported machinery. There are now two rolling mills, one of which is successfully coping with a seriously felt want in light rails, but even these are at present dependent for raw material on scrap iron and steel, chiefly obtained from the railways. The necessity for having local supplies of pig-iron has become more than ever obvious as the result of the war. It seems, however, unlikely that any steps can be taken at present to utilise the iron ores of the Transvaal. The war has made it even more difficult to obtain machine tools than industrial machinery, so that it has not been possible to make a start, for which such an excellent opportunity presented itself, in engineering work, such as locomotive building.

Apart from mining there is an exceedingly limited demand for machinery. The most noticeable fact is the absence of engineering works. Power is at present very little used by the farmer or pastoralist in South Africa as compared with Australia or New Zealand, and the importation of small gas and oil engines for use on farms is exceedingly small. Another surprising feature is the very limited use of coal gas, either for lighting or heating. This is no doubt due in the Cape Province to the high price of coal, which has to be brought by sea from Natal, or by rail from the Transvaal. Competition has no doubt greatly reduced the cost, but electricity had too long a start to be displaced. Electricity may be said to have matters all its own way in practically every centre. In the direction of meat packing there is promise of great development.

There is little to be said regarding public engineering works. Several water and sewage schemes are pending. In relation to the Cape Town water supply, the expert committee has reported the proposal to add a hydro-electric installation to be impracticable. Any electrical development which may come later, such as electrification of suburban railways, will be in the direction of a new power station.

Supplies of electrical apparatus, &c., previously obtained from Germany, have been furnished by the United States and Japan, into whose laps an unusually large share of the trade of South Africa has fallen during the past two to three years. In respect of machinery, however, South Africa, as is pointed out elsewhere, is a peculiarly small buyer apart from mining requirements. There is no scope of importance for the cheap American gasoline engine, stationary or marine, because so few engines of this kind are required. There is a restricted market for wood-working machinery, and for heavy machinery generally there is no partiality for American makes, so that little business has been given across the Atlantic. Unfortunately, urgent necessity seems likely to cause the purchase of locomotives required by the South African railways from America owing to British makers being engaged on war work. The requirements of the gold mines have been specially arranged for by the Ministry of Munitions, and the transference of orders to the United States has consequently not been large.

As regards industrial machinery, refrigerating plant, woollen or paper mills, cement-making plant and the like, it is essential that manufacturers should realise the elementary facts in relation to countries such as South Africa, which are—apart from mining—only on the threshold of industrialism. Apart from the engineers actually engaged in direct connection with established factories, there are practically none who are specialists in connection with any particular industry. There are, for instance, only two firms manufacturing cement, one woollen mill, two match factories, and no paper mills at all in the country. A glass factory and a coal-tar distilling plant were set up, and subsequently shut down. Even industries such as wood-working, laundries, and others which are carried on in most populous centres are few and on a small scale; and it may fairly be said that no one of these could provide enough business to justify anyone who wished to make a living in specialising. Consequently, manufacturers of plant, if they desire business, must be prepared to provide the expert knowledge themselves. If necessary, they must be ready to send men out to assemble, install, and start up such machinery as they sell. They must, at least, always provide complete working drawings, and full explanations, such as any mechanical engineer without specialist knowledge can understand and work on. Further, it must be borne in mind that inquiries usually come from people who have no engineering knowledge at all, and whose first question is: "How much capital would it require to set up such-and-such an industry?" Some British firms fully understand this, and go to enormous trouble to work out specifications on a basis of a minimum output which could be produced with reasonable economy; but many more obviously do not.

A subsidiary point is the need for British manufacturers to keep themselves fully posted as to local conditions, such, for instance, as the effect of the high altitudes and low atmospheric pressures on prime movers, both steam and internal-combustion engines, and the areas of South Africa where such altitudes are to be found. The frequency and violence of thunderstorms, the destructive effect of the climate on many kinds of timber, as well as the depredations due to insect life are other points in this category. Many of these important factors are taken for granted by those who live in a country as matters of common knowledge, and they do not always remember to point them out in their inquiries for plant.

Yet another matter to bear in mind is the backward condition of engineering, and consequent difficulty and expense of getting repair work or replacement carried out in many centres. It is, therefore, of vital importance that those lapses which manufacturers are too often inclined to deny should not take place, and that the reliability which they claim for their foremen, their testing and packing staff, and for their system generally, should stand good in all circumstances.

Satisfactory agency arrangements in the case of industrial machinery constitute a very difficult problem. The mining industry is on such a large scale, and is, on the whole, so much centralised, that it has been found possible to organise supply with extreme efficiency and economy. In the case of general industrial machinery, on the other hand, the opposite is the case. Those firms which are qualified to handle such inquiries are to some extent overloaded already, and it is a little doubtful to what extent any of them are in a position to look for business, or still less to create openings. For instance, in connection with the frozen meat industry, much can be done in actually providing the initiative and the suggestion leading to the formation of companies. To study local conditions and economies, and then come forward with a practical working scheme and knowledge as to the capital required, may at least accelerate the formation of such undertakings, and will certainly go a long way to secure goodwill. Manufacturers may further interest themselves financially in such ventures without necessarily taking up the whole financial burden.

There is very ample room for a group or groups of manufacturers of industrial machinery of all kinds, woodworking, machine tools, textile, &c., to have their own representatives on the spot, not only to look for business and deal with inquiries, but to look for possibilities and actually prompt inquiries. To leave this work to busy indent agents, already pre-occupied with local interests of all kinds, seems to the Commissioner unsound. With more initiative, more business can be created, and industrial development can be accelerated. A commission basis in this work also is wrong. Representatives should be good trained men, tactful, and energetic; but it is essential that they should not be deterred from seemingly thankless pioneer work by being dependent for a living on quick results. Nor must they be in the position of having to spend money themselves on travelling long distances to follow up inquiries, with a feeling all the time that it is a gamble whether there will be business to pay for the journey. The representative must be well paid with salary and expenses, and he must be able to have permanent headquarters. In connection with mining, many firms send out their own expert representative, and attach him to the staff of their local agents. This is an excellent arrangement, and a similar plan might be adopted in the case of industrial machinery, except that the representative would probably have to look after the interests of a home group instead of a single firm. For instance, a group might be formed to cover all the industries connected with, and derivative from, frozen meat, makers of abattoir plant, refrigerating machinery and ammonia compressors, disintegrators and fertiliser machinery, and by-product recovery. Fellmongers' machinery has in the past come chiefly from Germany and America. The making of glue and gelatine, tanning and currying, are similarly allied to the slaughter of cattle, and wool scouring and drying lead easily on to carding and spinning. In this way a very considerable range of machinery could economically and efficiently be not merely represented, but actively pushed. The initiative for forming such groups must come from manufacturers themselves.

* Cd. 8,614. Price 3d.

REVIEWS.

The Year Book of Wireless Telegraphy and Telephony, 1917. 928 pp. London: Wireless Press, Ltd. Price 3s. 6d. net.

The fifth issue of this well-known year-book has been considerably extended in point of size, and still more so in point of matter contained—both remarkable achievements in these days of printing difficulties, paper restrictions, and price. Nor is there any lack of improvement in quality, but the price of the volume remains the same, and might be called ridiculously low were one not so thankful to obtain anything at once cheap and good in these days! The task of reviewing so compendious a work is best attacked by giving some indication of the scope of its three main sections, viz., the reference section, the technical section, and the special contributions.

The reference section is naturally much the same as in

previous years, but has, of course, been brought up-to-date. The "record of development," which is necessarily far from complete since August, 1914, nevertheless contains a number of items for 1916 which bear eloquent witness to the extended use and incalculable possibilities of wireless telegraphy. Amongst the items which have hardly been noticed in the stress of war by others than those directly affected are the part played by wireless during the Irish rebellion (when the English cable was cut); the compulsory licensing for wireless of every British-registered vessel of 3,000 tons or over; and the establishment of commercial radio-service across the Pacific. Partly in order that the latter achievement may be appreciated more fully, the "wireless map" in the year-book is in the form of a duplicated Mercator, showing the Far East as reached by both eastern and western routes.

The reprints (translated where necessary) of the world's wireless laws and regulations have been revised in accordance with the amendments made by certain British dependencies and foreign countries during 1916, and the function which the year-book discharges in thus providing a reliable collection of all national and international regulations and agreements, is of great utility, for it facilitates enormously the establishment of world-wide consistency and the observance of all special requirements.

The list of land and ship stations is unique and invaluable, and is as complete as it can be under present conditions. We would again suggest that the notes on nature of service would be more convenient if arranged at the foot of each page instead of being at the end of the list. We trust that it will soon be possible to record in this list a large number of stations open for public wireless telephone service. Whilst mentioning wireless telephony, we would again urge that a reasonable proportion of the year-book be devoted to this important subject. Possibly the fault is ours, but so far we fail to find any other mention of wireless telephony than in the title of the year-book and in a few items in the record of developments. In view of the achievements of 1915 it is hardly conceivable that there is nothing which might usefully be said concerning wireless telephony in 1916. Probably the truth of the matter is that it would be *too useful*—to the enemy!

The standard features of the technical section have again been revised and brought up-to-date. In addition to the chapter on international time and weather signals, there are many pages devoted to useful data, and to a very valuable collection of useful formulæ and equations which has been revised by Dr. Erskine Murray. The same authority has also compiled a glossary of terms used in wireless work, combining the glossary issued in previous editions with definitions derived from other European sources, and with the definitions evolved by the American Institute of Radio Engineers. The result is a table which it is hoped "will find acceptation on both sides of the Atlantic." Our old friend, the five-language dictionary of wireless terms, again appears, and very welcome it is; but why have not the Russian equivalents of the words been added? Surely, the time is ripe for that addition. The catalogue of wireless telegraph patents has been brought up to date, and other similar lists which are so invaluable for reference purposes are the bibliography of books and periodicals in all languages dealing with wireless matters, and the directories of wireless societies and of companies engaged in the commercial development of wireless. The ever-extending collection of portraits and biographical notices forms in itself a sufficient testimony to the status and world-wide development of wireless telegraphy.

Turning now to the special contributions, these include some articles of technical interest and some of general interest, and are alone worth the price asked for the whole volume. A summary is presented of Judge Mayer's decision in the Fleming Valve-De Forest Audion action, which decision constitutes an education in itself on the subject of detectors, and is regarded as one of the finest technical decisions ever promulgated. Dr. Fleming writes with characteristic thoroughness on the electric arc as a generator of persistent oscillations; Dr. Eccles contributes a fine monograph on the peculiar action and immense possibilities of ionic valves; Prof. Howe writes on the inductance, capacity, and natural frequency of aerials; and Dr. Marchant deals with what is commonly known as the "Heaviside layer"—that hypothetical, but probably existing, ionised layer of the upper atmosphere which offers so much in the way of explaining why signals can be sent across the Atlantic from and to aerials only a few hundred feet high, round or over a wall of water and earth nearly 100 miles high. Mr. C. H. Taylor's experience in the construction and working of American long-distance stations enables him to write with authority on this subject, and, whilst his article will be found instructive by the specialist, even those readers with little technical knowledge will also be able to profit from his lucid exposition.

Of Imperial interest are the tales of "wireless heroism," recounting the deeds of operators who were singled out for official recognition last year. "The Wireless Drama," by A. Noyes, describes one "incident" in which a U-boat was thwarted by wireless; the achievements of wireless telegraphy are surveyed by P. W. Harris; and a list is given of vessels which have figured in disasters where loss of life has been prevented or mitigated by "wireless to the rescue." In concluding these remarks, which do less than justice to a most fascinating and valuable volume, we may mention that the map showing the wireless stations of the world has been improved, not only by enlargements, but also by printing in red those stations which are open for ship and shore communication.

Primary Batteries: Their Theory, Construction, and Use. New and enlarged edition. By W. R. Cooper, M.A., B.Sc. London: *The Electrician* Printing & Publishing Co., Ltd. Price 12s. 6d. net.

Since 1901, when the first edition was published, Mr. Cooper's "Primary Batteries" has deservedly been regarded as the standard book on this subject. While in the intervening 16 years no radical developments have taken place either in the theory or in the main types of primary batteries, considerable improvements in details of construction have come about, and for the book to maintain its position, at least on the descriptive side, it was essential to bring it up to date. This Mr. Cooper has done with the same care and discrimination as were displayed in the original compilation.

In the first five chapters, which cover the theory of the subject, few changes or additions are to be noted. True, the electron theory has become of outstanding importance since the date of the first edition, but, as the author remarks, while it gives us a simple way of looking at some of the phenomena, it does not add directly to our knowledge of primary cells—except in the rather special case of selenium cells.

Among the newer types of one-fluid cells described (Chapter VIII) is the interesting Benkö bichromate cell, in which polarisation is eliminated by forcing the electrolyte or allowing it to diffuse through the carbon negative plate. Descriptions of improved forms of the Edison-Lalande cell, the Columbia Track, largely used in America, and the Neotherm cell, and an account of Bellini's interesting cell in which the positive plate is amalgamated lead and the electrolyte a mixture of sulphuric and nitric acids, have also been added to this chapter. A further important addition is a section on the effect of the physical quality of manganese peroxide on its depolarising power, and the Post Office specification for Leclanché cells is also a new and useful feature of this chapter. New matter in the following chapter, dealing with two-fluid cells, includes an account of the Bleeck-Love, an Australian cell with zinc/lead-peroxide elements, the E.M.F. of which, 2.5 volts, is higher than that of any other primary cell.

Dry cells (Chapter X) are of particular importance at the present day, when enormous numbers are being manufactured daily for use in pocket flashlamps. It is a curious omission that the small cells used for this purpose are not specifically dealt with. Although they are, to be sure, merely miniature forms of the standard types of dry cells, they certainly present problems of their own which might have been discussed. Otherwise, this chapter is most informing, particularly on the question of tests, which is discussed somewhat fully. Included here are an account of the methods of testing standardised by the American Electrochemical Society, and the specifications on the same subject issued by the British Post Office. The chapter on standard cells (Chapter XI) has also been much enlarged and revised, the chief novel features being a full account of the latest practice in the preparation of the materials, and the assembling of Clark and Weston cells based on the methods employed at the National Physical Laboratory and the Bureau of Standards at Washington. The information in this chapter, as throughout the book, is brought home to the reader and rendered exact by constant reference to quantitative tests, and the book abounds in illustrative curves.

An entirely new chapter discusses the properties, theory, and uses of selenium cells, and very useful it is to have collected together the considerable amount of scattered information on this subject that is now available.

The last chapter, dealing with carbon-consuming cells, differs little from that in the first edition—a sad tribute to the disappointed hopes of many an ingenious inventor. The direct production of electricity from coal remains a dream of the future.

CANADIAN ELECTRIC COOKING NOTES.

The recent business convention of the Canadian Electrical Association, at Montreal, dealt briefly, in one of its reports, with the question of electric cooking and heating, and its future development. This branch of supply business has been, to a large extent, "side tracked" in Canada, as in this country, by more pressing matters, but it is considered that it is now on a sound basis, and that electric cooking will be universally adopted within a very few years.

It is agreed that the range load will come in part on the peak of the average station, but that this will be more than offset by its demands at other times, particularly in the morning.

The maximum demand of a group of 20 ranges or more rarely exceeds 15 per cent. of the installed capacity, and this diversity reduces the additional investment of the station on account of the load, and ought to provide an incentive to supply authorities to

refrain from half-hearted methods of tackling the cooking problem.

The report to which we refer goes on to consider water heating, remarking that "one can scarcely be considered without the other, for very often the installation of an electric range means the removal of the old method of heating water for domestic purposes. While the load characteristics appear to oppose each other, they have a complementary effect in balancing the load curve. The peak of hot water heating often comes on as late as 10 p.m., where heaters are used to a large extent for dish washing and bathing.

"One of the principal member companies in Canada is engaged at the present time in working out a plan to sell, on a term basis, electric ranges connected up ready to operate. The same company already has in effect a water-heating proposition, under which they furnish, install, and connect water heaters for a definite sum. These heaters are arranged to be connected for 500 watts under a flat rate, and 2,000 watts through the meter. Current for the high heat is sold at the residence rate, the heater consumption usually being billed entirely on the third step of the rate, which is low.

"It is recommended that, so far as possible, water heaters installed in connection with ranges be placed on a double-throw switch, so that the water heater is not in circuit while the range is in use."

The water-heating problem has not yet met with a satisfactory solution in this country, one reason, no doubt, being that the coal range and boiler are fixtures, and are not removed from the premises when the electric range is installed, while another and more material reason is the lack of serious effort by supply engineers and electrical manufacturers to meet the competition of rival methods.

The following brief statements on the development of business represent the views of Canadian central station men in touch with the demands of the situation :—

"Central stations must plan to take care of as much business as gas companies have in ranges."

"Efficient salesmen specialising in the business of ranges must be employed."

"Educate the customer in efficient operation."

"A national publicity campaign on the ease, safety, cheapness, and other advantages which the electric range alone possesses."

"Central stations must sell service rather than KW.-hours and cooking rather than ranges."

"The fullest co-operation must obtain between the manufacturers, contractors, and central stations."

Attention is drawn to the cost of connecting ranges, which should be reduced.

Many companies are not prepared, so far as their circuits are concerned, to take on a cooking load without some additional expense, and it has been found that the costs for individual service range from $75 to $100, a figure which will decrease with numbers.

The Association is recommended to carefully investigate the question of keeping down distribution cost and providing satisfactory regulation.

In reference to range construction, it is pointed out that manufacturers are guaranteeing a life of 4,500-5,000 hours for heating units, which can readily be renewed.

The following features are regarded as essential :—

Indicating device to show whether current is "on" or "off."

Standard elements, quickly and cheaply interchangeable.

Oven construction such that it can be thoroughly and easily cleaned ; a reliable thermometer.

Terminal contacts placed so as to give the minimum of trouble ; separate fuses for each heater ; and rigid frame construction.

In an address at the same Convention, Mr. Julian C. Smith referred to the time, five or ten years hence, when the average demand of the domestic consumer will reach 300 KW.-hours per capita, instead of 100 KW.-hours, which is considered the present average.

It is the fact that we have not sufficiently probed the electrical possibilities of the domestic consumer, and until we do so, it is impossible to estimate the probable effect of the domestic load on the station or even to frame a tariff which will result in the desired development.

A GRANULAR CARBON ELECTRIC FURNACE.*

By SAMUEL A. TUCKER.

A VERY useful furnace for maintaining temperatures considerably above those possible with the usual wire-wound furnace has been constructed in our laboratories (Columbia University).

The design here shown in figs. 1 and 2 is simple to construct, the parts are inexpensive, it will reach a high temperature in a short time, energy consumption is not great, and the heated space is perhaps larger than is usually found in such furnaces. One difficulty in using a circular granular carbon resister is in the tendency to uneven heating, particularly at the start. This furnace is, therefore, provided with four electrodes, as shown in the sketch.

* *Metallurgical and Chemical Engineering.*

The furnace body, 12 in. × 12 in. × 9 in., is of fireclay, with an opening as shown. This particular shape was used because it happened to be in the laboratory ; however, such a body could have been taken from one of the usual gas crucible furnace parts which are to be obtained on the market. Four holes are bored to admit the electrodes about 1 in. diameter to the open space D ; this space is partitioned by the carborundum ring C, which is 4 in. outside diameter $3\frac{5}{16}$ in. inside and $3\frac{1}{4}$ in. high. This gives an annular space for the granular carbon connecting all four electrodes.

Granular carbon was obtained from the National Carbon Co., the size of grain being about 20 mesh, and was filled in to the top of the refractory ring.

The ring itself was constructed as follows (fig. 3) :—Carborundum ground fine in a ball mill was mixed with 25 per cent. fireclay and

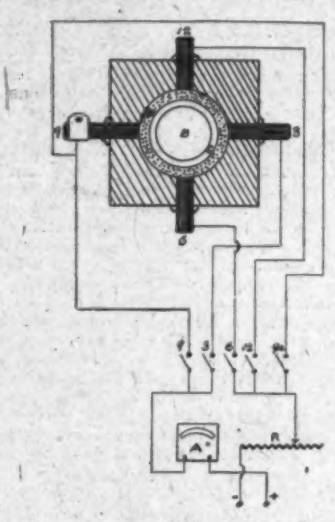

FIG. 1.—HORIZONTAL SECTION OF FURNACE.

enough water added to make a thick mass. This mix was then tamped into the cardboard mould shown in the drawing. The inner form at 1 and 2 is made by wrapping the cardboard on wood form 2, and holding it on the wood with small tacks or glue.

The outer form at 3 is also of cardboard held on the wood base projecting up inside the cardboard cylinder, as shown by the dotted line, and strengthened by the wood block at the top. In this way the form can be made quite strong enough, and, at the same time, is sufficiently porous to permit of the drying-out of the mixture. After thoroughly drying in a gas oven at 110° C., it is transferred to a gas muffle and thoroughly baked at a temperature of 900° to 1,000° C. The mould is, of course, lost, but it is so easily made that it is of little consequence. The ring so constructed is quite strong enough for the purpose intended, and the furnace cover, &c., may be made in the same way. Electrical connections are made as shown in the diagram from the five switches with wire of about 50-ampere carrying capacity. On closing switches 9, 3, 6, and 12 we have adjacent electrodes of opposite polarity, and a short time

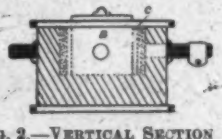

FIG. 2.—VERTICAL SECTION OF ELECTRIC FURNACE.

FIG. 3.—CONSTRUCTION OF RING.

will suffice to show whether the ring is heating evenly. Should this not be the case, and one quadrant appears to be too hot, this can be cut out by opening the switches for that position. When all have become evenly heated, 9, 6, and 12 are opened and 3 and 9A closed, by which arrangement it acts as a two-pole furnace, which is the normal manner of running.

The following figures give a run with such a furnace using direct-current at 120 volts through variable rheostats R :—

Time.	Amperes.	Volts.	Temp. deg. C.	Remarks.
9.30	25	—	—	4-pole
9.40	40	—	500	Changed poles
9.50	38	—	700	to regulate
10.00	12	—	720	2-pole
10.10	36	—	900	2-pole
10.30	18	98	1,000	2-pole
10.40	23	98	1,200	2-pole
11.00	24	98	1,300	2-pole
12.00	22	97	1,300	2-pole

The furnace was covered with a carborundum disk and further with asbestos board, with a small opening to allow the introduction of the thermocouple. In another case the furnace reached 1,400° C. in 45 minutes, using 50—60 amperes at from 51 to 53 volts.

It is necessary to have the electrodes fitted well to the openings provided in the body, and this can be done by wrapping with thin asbestos paper and luting with asbestos fireclay cement from the outside. Iron bands are necessary to clamp the body to prevent cracking.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

EXPORT PROHIBITIONS IN CERTAIN ALLIED AND NEUTRAL COUNTRIES.—The *Board of Trade Journal* has issued as a Supplement (in two parts) complete lists of the articles which are prohibited to be exported from the United Kingdom, Denmark, France, and Algeria, Italy, Japan, Netherlands, Norway, Portugal, Russia, Spain, and Sweden. Copies of the Supplement may be obtained, price 3d. each part (post free 3½d.), from H.M. Stationery Office, Imperial House, Kingsway, W.C. 2.

FRANCE.—The French Customs Department have recently issued a number of decisions regarding the classification of certain articles under the French Customs Tariff, among which the following are noted:—

Apparatus and machines for dissolving or softening rubber and gutta-percha—to be classed as apparatus not specially mentioned (number 525 *sex*).

India-rubber, not worked, mixed with indirect derivatives of coal tar—to be subject to duty, *on the whole weight*, as chemical products derived from products of the distillation of coal (number 280).

Asbestos substitute (admixture of mineral materials, cellulose fibres, and asbestos fibres)—to be classed as cellulose pulp, mechanical, dry (number 168).

PORTUGAL.—Some further restrictions on the exportation of certain goods from Portugal have been decreed since the issue of the Board of Trade Supplement above referred to. The new restrictions include asbestos in any form, and manufactures thereof; rubber wares, balata, gutta-percha, and other similar products in any form; chromium, manganese, molybdenum, mercury, nickel, titanium, vanadium, precious metals, and alloys thereof, in any condition; emery, corundum, natural and artificial (alundum), carborundum, and any other substance for similar use; ferro-silicon; graphite; electrical material suitable for use in war, and accessories and separate parts thereof. Exportation of any of these goods may only be effected under authority issued by the Ministry of Finance, and subject to the payment of any existing surtax on the goods.

UNITED STATES OF AMERICA.—According to a Treasury Department Circular recently issued, mail packages found upon examination to contain samples having a dutiable value of less than one dollar will be admitted free of duty, and no mail entry will be required. [This modifies the announcement in the Review of June 29th.]

ST. VINCENT.—A new schedule of import duties has been brought into operation by Order-in-Council, and took effect on April 1st last. An all-round increase in the rates of duty has been made, with the expressed purpose of increasing the revenue of the Colony. Hitherto the majority of goods imported have paid a general *ad valorem* rate of 10 per cent. for British goods and 12½ per cent. for foreign. The new rates are 13½ per cent. and 17½ per cent. respectively. The specific rates of duty, which are comparatively few in number, have been increased in the same proportion. Electrical machinery not on the free list accordingly will pay 13½ per cent. *ad val.* under the British Preferential Tariff, and 17½ per cent. *ad val.* under the General Tariff. [Note.—The free list includes telegraphic, telephonic, and electrical apparatus and appliances of all kinds for communication or illumination; also certain other classes of electrical machinery and appliances when not imported for sale.]

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

10,535. "Apparatus for electroplating articles having holes." G. L. A. R. B. Colin and Platt Bros. & Co. July 23rd.
10,575. "Circuit interrupting devices." British Westinghouse Electric and Manufacturing Co. (Westinghouse Electric & Manufacturing Co., U.S.A.). July 23rd.
10,583. "Dynamo-electric machines." S. F. Barclay & Vickers, Ltd. July 23rd.
10,587. "Electro-therapeutic apparatus." M. Vernon-Ward. July 23rd.
10,588. "Contact makers and interrupters for ignition systems." W. J. Mellersh-Jackson (Philips-Brinton Co.). July 23rd.
10,606. "Combined electric motor and generator." H. Pearse. July 24th.
10,612. "Electric connecting clip." S. George & T. J. Hutchinson. July 24th.
10,615. "Magneto-electric machines for ignition in internal-combustion engines." M. S. Connor & C. C. Pucketts. July 24th.
10,616. "Electric starters for combustion engines." D. C. S. Sandeman. July 24th.
10,630. "Condensers for ignition magnetos." M-L. Magneto Syndicate and E. A. Watson. July 24th.
10,642. "Contact apparatus for magneto-electric machines." T. H. Cleathero & F. Spurr. July 24th.
10,652. "X-ray tube stand and table." E. E. Grenville. July 24th.
10,664. "Electrical appliances for igniting combustible gases." S. J. Bennett. July 25th.
10,694. "Electrical drilling apparatus." H. Scholey & F. N. Woodhouse. July 25th.
10,704. "Electrical heating apparatus for aircraft." F. N. Shumaker. July 25th.
10,708. "Multiple-type fuses." E. S. Conrad. July 25th.
10,709 and 10,710. "Prismatic glassware for illuminating." Holophane, Ltd. (Holophane Glass Co., U.S.A.). July 25th.
10,737. "Insulating composition for magneto distributors." T. S. Chivers & C. Marter. July 26th.
10,748. "Wireless signalling systems." British Thomson-Houston Co. (General Electric Co., U.S.A.). July 26th.
10,765. "Glassware for illuminating." Holophane, Ltd. (Holophane Glass Co., U.S.A.). July 26th.
10,766 and 10,767. "Prismatic glassware for illuminating." Holophane Ltd. (Holophane Glass Co., U.S.A.). July 26th.
10,769. "Means for destroying submarines." General Electric Co. July 26th.
10,772. "Ignition current generators." L. J. le Pontois. July 26th.
10,773. "Method of removing and replacing storage battery connectors." H. S. Bowler & F. Fremmer. July 26th.
10,778. "Electrically-heated radiators." A. F. Berry. July 26th.
10,779. "Electric heat radiators." A. F. Berry. July 26th.
10,785. "Methods of forming and treating electric coils." J. W. Horley. July 27th.
10,794. "Magnetising coils." Automatic Telephone Manufacturing Co. and P. N. Rosery. July 27th.
10,813. "Magnetic drive for petrol pumps for aeroplanes." P. Delves-Broughton. July 27th.
10,817. "Operating electric switches from a distance." A. H. Franks and Telephos Domestic & Street Lighting Co. July 27th.
10,822. "Electrical induction apparatus." British Thomson-Houston Co. (General Electric Co., U.S.A.). July 27th.
10,830. "Utilisation of high-frequency oscillations in wireless installations." D. W. Brown. July 27th.
10,832. "Telephone transmitters." J. Birrell, W. Birrell & R. A. Cavenaugh. July 27th.
10,843. "Electric batteries." Syndicaat Graamans Patents. July 27th.
10,859. "Tramway systems and transporting goods thereon." P. Kenton. July 28th.
10,884. "Sparking plugs." T. J. Spidy. July 28th.
10,885. "Electric starters for internal-combustion engines." A. H. Midgley & C. A. Vandervell & Co. July 28th.
10,889. "Insulating or covering materials." J. C. Crets. July 28th.
10,896. "Electric switches." C. P. Dreschler. July 28th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

2,696. Lamp Globes or Shades. T. Masuda. August 23rd, 1916. (107,603.)
6,407. Electric Engine Starter and Electricity Generating Systems. C. F. Kettering & W. A. Chryst. October 11th, 1915. (101,784.)
9,246. Measuring Instruments, Relays, and the like. Marconi's Wireless Telegraph Co. & H. A. Ewen. June 30th, 1916. (107,622.)
9,288. Propelling Devices. B. Schmelzer. July 3rd, 1916. (107,627.)
9,370. Electric Lamp and the like Guards. St. Helens Cable & Rubber Co. & J. C. White. July 4th, 1916. (107,633.)
9,539. Measuring the Frequency of Electric Currents. Marconi's Wireless Telegraph Co. & I. Shoenberg. July 6th, 1916. (107,647.)
9,541. Electric Rotary Converters. British Westinghouse Electric and Manufacturing Co. (July 6th, 1915. (100,847.)
9,749. Spark Plugs. O. Baysdorfer & G. Baysdorfer. July 11th, 1916. (107,653.)
9,776. Electrical Heating Apparatus. A. M. Jane. July 11th, 1916. (107,655.)
9,825. Electric Accumulator Containers. B. M. Drake & D.P. Battery Co. July 12th, 1916. (107,656.)
9,926. Electric Pocket Lamps. M. Steinman (E. Picard). July 14th, 1916. (107,658.)
10,038. Portable Dust Suction Apparatus. R. Haddan (Elektromekaniska Aktiebolaget). July 17th, 1916. (100,954.)
10,072. Electric Fuses or Cut-outs. L. Newitt. July 18th, 1916. (107,664.)
10,535. Electric Resistances for Compensating and the like purposes. J. E. Pollak (Soc. Anon. des Etablissements L. Bleriot). July 26th, 1916. (107,675.)
10,720. Combined Starter and Lighting Dynamos. A. H. Midgley and Vandervell & Co. June 28th, 1916. (107,680.)
11,055. Electric Oscillating or Wireless Systems and Apparatus. Indo-European Telegraph Co. & A. H. Morse. August 4th, 1916. (107,682.)
13,659. Controllers for Electric Motors and like Apparatus. G. Ellison. September 26th, 1916. (Addition to 12,882/13.) (107,699.)
14,703. Holders and Supports for Incandescent Electric Lamps. H. C. Gabell. October 16th, 1916. (107,705.)
17,603. Detection of Earth Connections in Electric Cables. G. Giles. December 9th, 1915. (102,621.)
17,936. Energy Meters for Alternating Electric Currents. Fabrique des Longines Francillon & Co. April 22nd, 1916. (106,465.)

1917.

579. Door Operating Apparatus. W. M. Hummel. January 11th, 1917. (107,731.)
3,958. Magneto-electric Generators. G. F. Cooke. March 19th, 1917. (107,741.)
5,753. Ignition Arrangements for Internal-combustion Engines. C. F. Kettering & W. A. Chryst. October 11th, 1915. (Divided application on 6,407/16.) (105,922.)

United States Training Camp Equipment.—The electrical requirements of the 16 great camps that are being established for the training of the new U.S. Army are outlined in the *Electrical World*. The principal items include 20,800,000 ft. (6,339,853 m.) of insulated wire, 260,000 ft. (79,248 m.) of lamp cord, 125,000 key sockets and shades, 150,000 cleat receptacles, 3,175,000 pairs of porcelain cleats, 1½ million porcelain tubes, seven million screws, 4,800 lb. (2,177 kg.) of solder, and other materials in proportion.

After the war, perhaps, we shall be able to give some particulars of the electrical work done in our own camps, which must have been on a colossal scale.